

USFS National Flow Gage

Gap Analysis - Region 1



Souris River, North Dakota, USGS



Prepared by

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Commissioned by

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Introduction

The purpose of this study is to review the location of stream gages across the region that are located on, or near, US National Forest System (NFS) lands, and to determine where there are gaps in the distribution of gages across the region.

Questions answered by this analysis include:

- What proportion of the lands in Region 1 are NFS lands?
- What is the extent of the stream network in the region?
- Where are the operational stream gages?
- Where have gages been discontinued?

Data presented in these slides were obtained from the following:

- **Streams:** stream layers (1:100K) were downloaded from the NHDPlus website:
<http://www.horizon-systems.com/nhdplus/data.php>
- **Gages:** 1,248 stream gage locations were downloaded from the USGS website:
<http://waterservices.usgs.gov/rest/Site-Test-Tool.html>

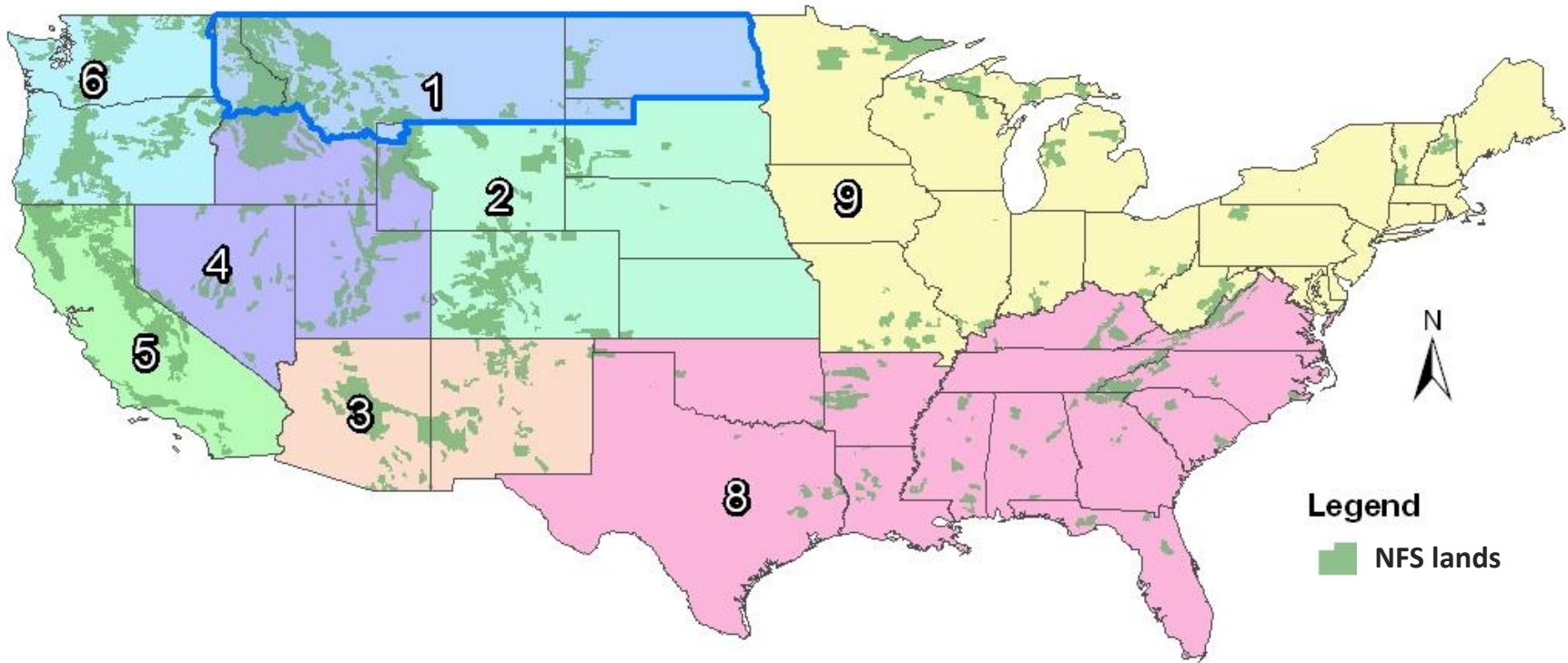
A note about the gage data:


Gage data were downloaded in fall 2011. We assumed that gages having no data beyond 12/31/09 were inactive and were labeled “Historic” in this analysis. Gages that had data past 1/1/10 were considered “Current” in the event their data had not yet been added to the website.

Summary Data

Attribute	On NFS lands in Region 1	All of Region 1	% NFS vs. Region 1
Land Area (km ²)	121,000	646,800	18.7
Stream Length (km) (for basins >4 km ²)	52,500	304,500	17.2
Number of Historic Gages	127	808	15.7
Number of Current Gages	33	359	9.2

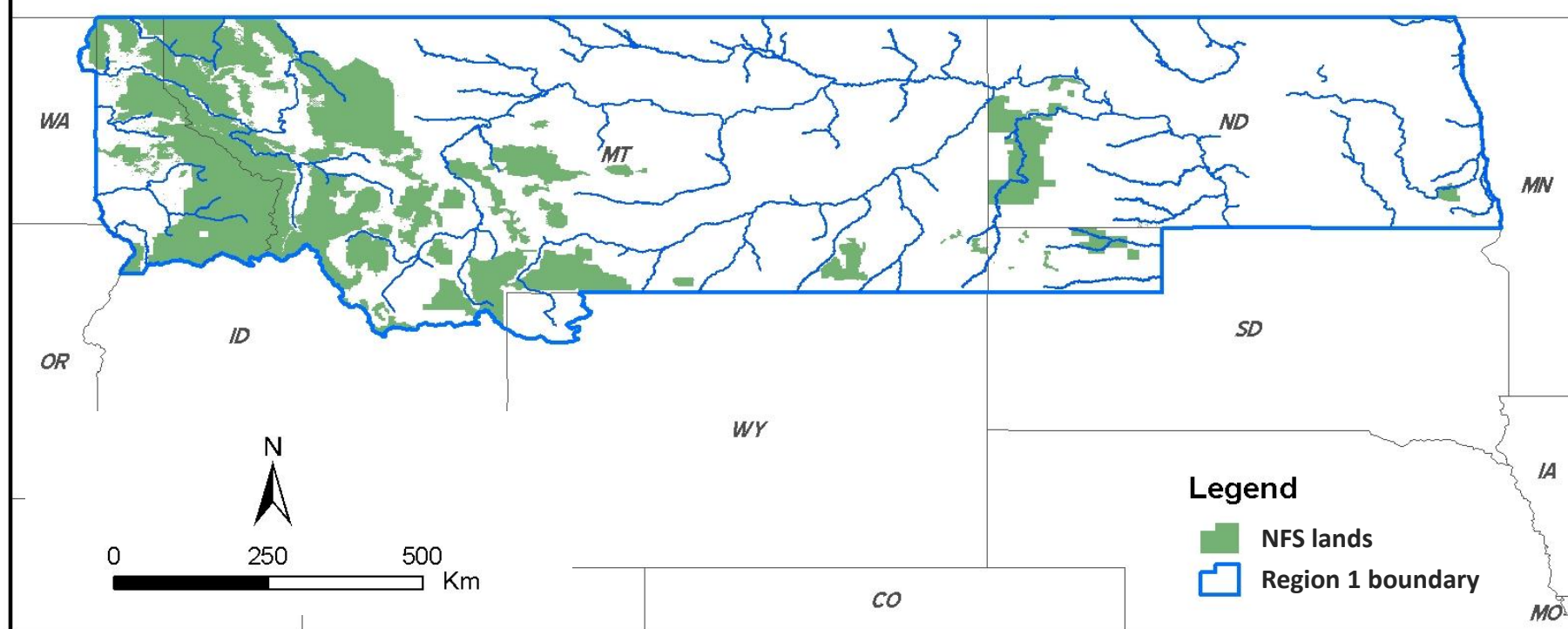
USFS Regions in Lower 48



	NFS lands  in R1	All lands in R1	% NFS lands in R1
Area (km ²)	121,000	646,800	18.7

River Network in Region 1

Shown are rivers draining basins > 2,000 km²



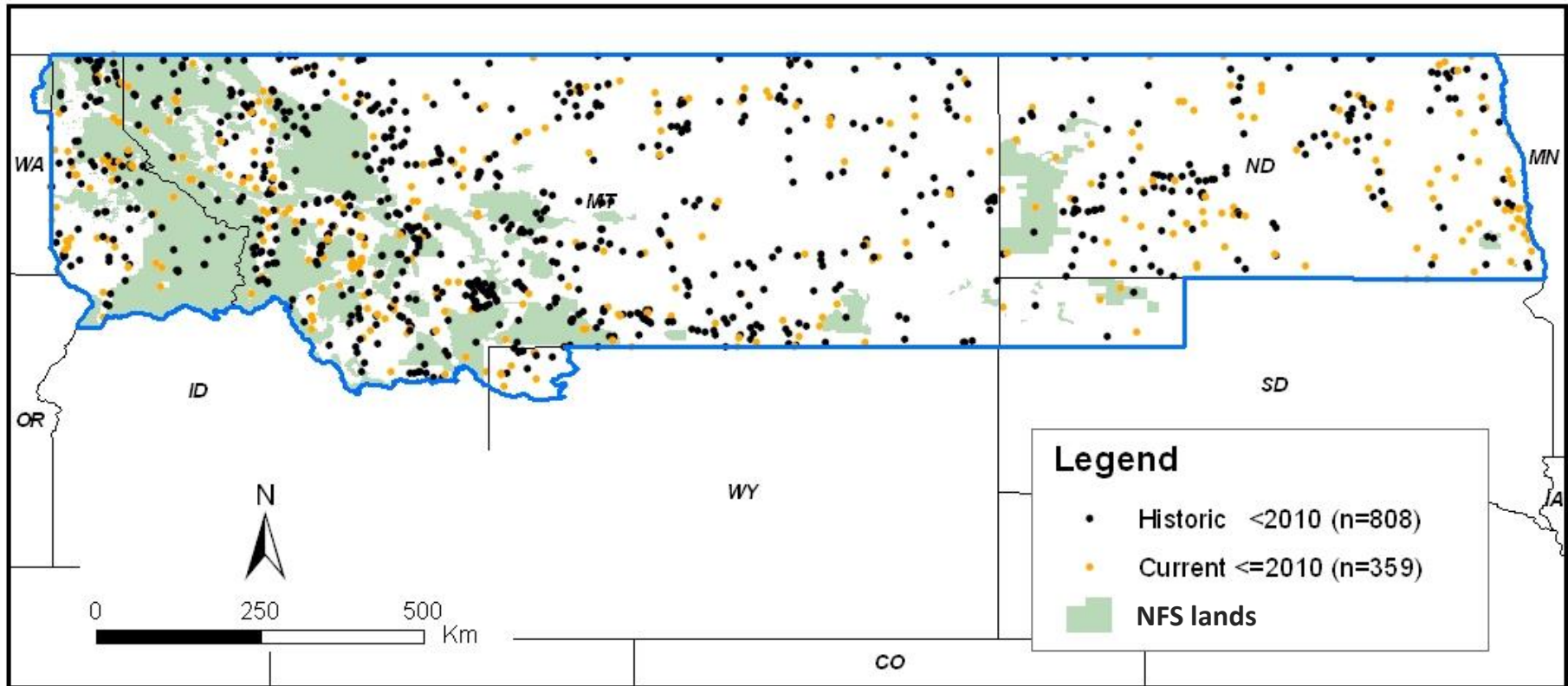
	NFS streams in R1	All streams in R1	% NFS streams in R1
Stream Length (km) (for basins >4 km ²)	52,500	304,500	17.2

The following slides show
the location of
USGS gages
having discharge data collected from
1912 through 2012



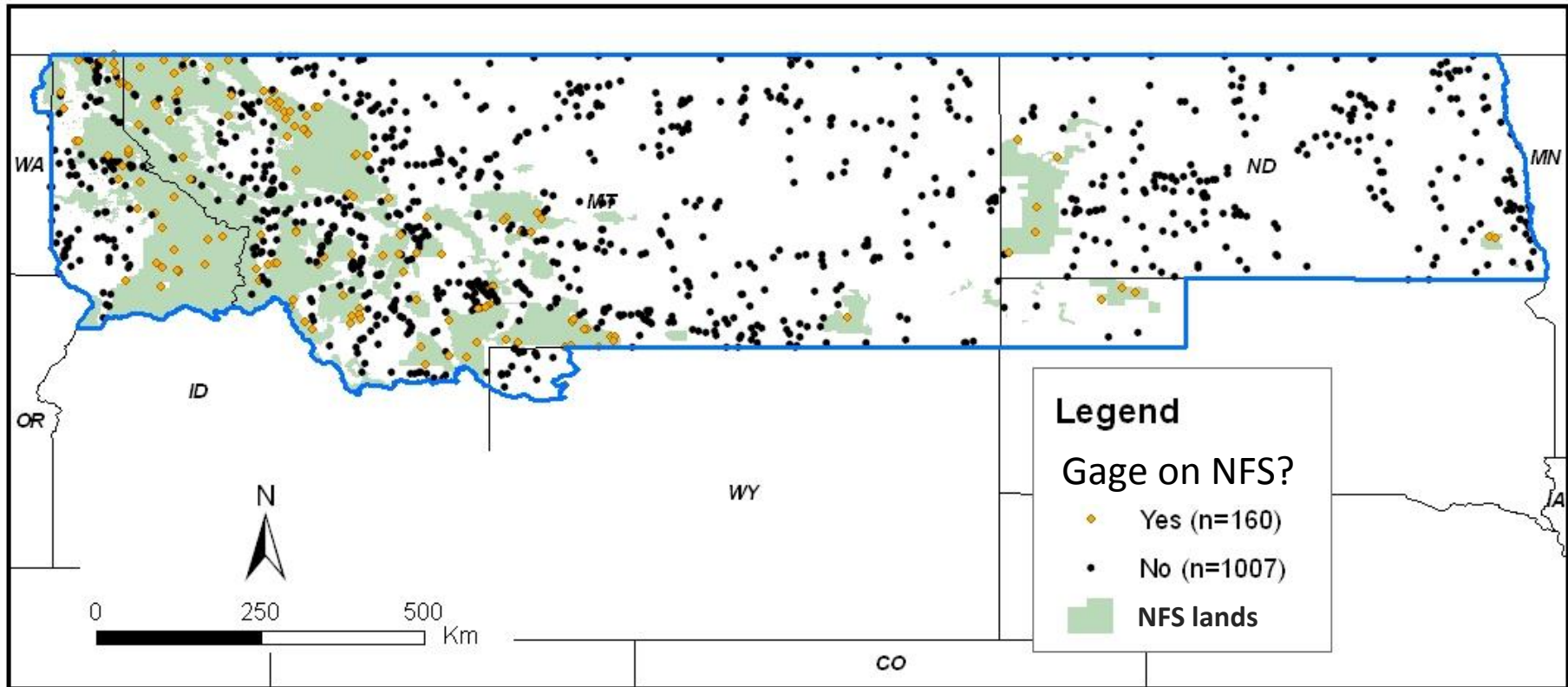
Lower Flathead River, Montana

Historic and Current USGS Stream Gages from 1912 - 2012 (n=1,167)



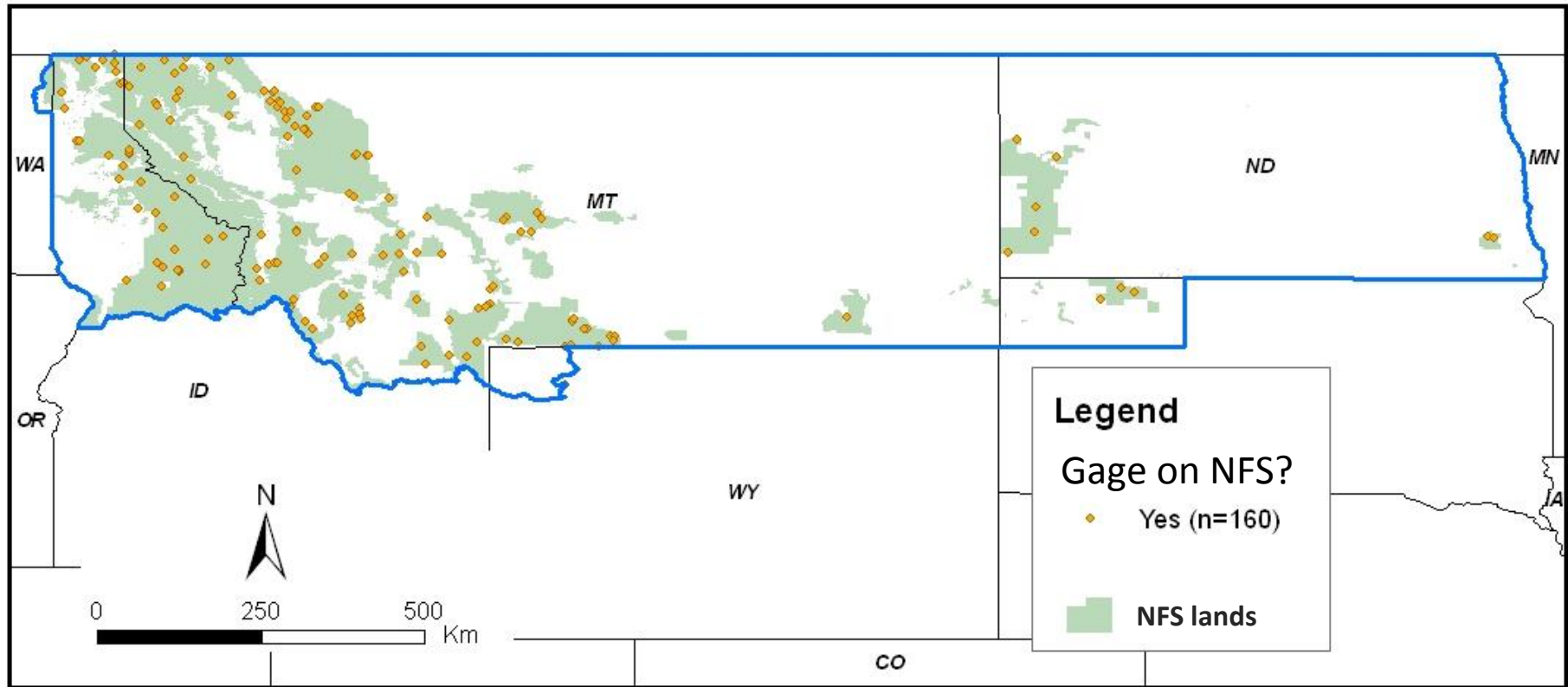
	Gages on NFS lands in R1	All gages in R1	% Gages on NFS lands in R1
Historic Gages	127	808	15.7
Current Gages	33	359	9.2

USGS Stream Gages from 1912 - 2012: Identifying those off and on NFS Lands



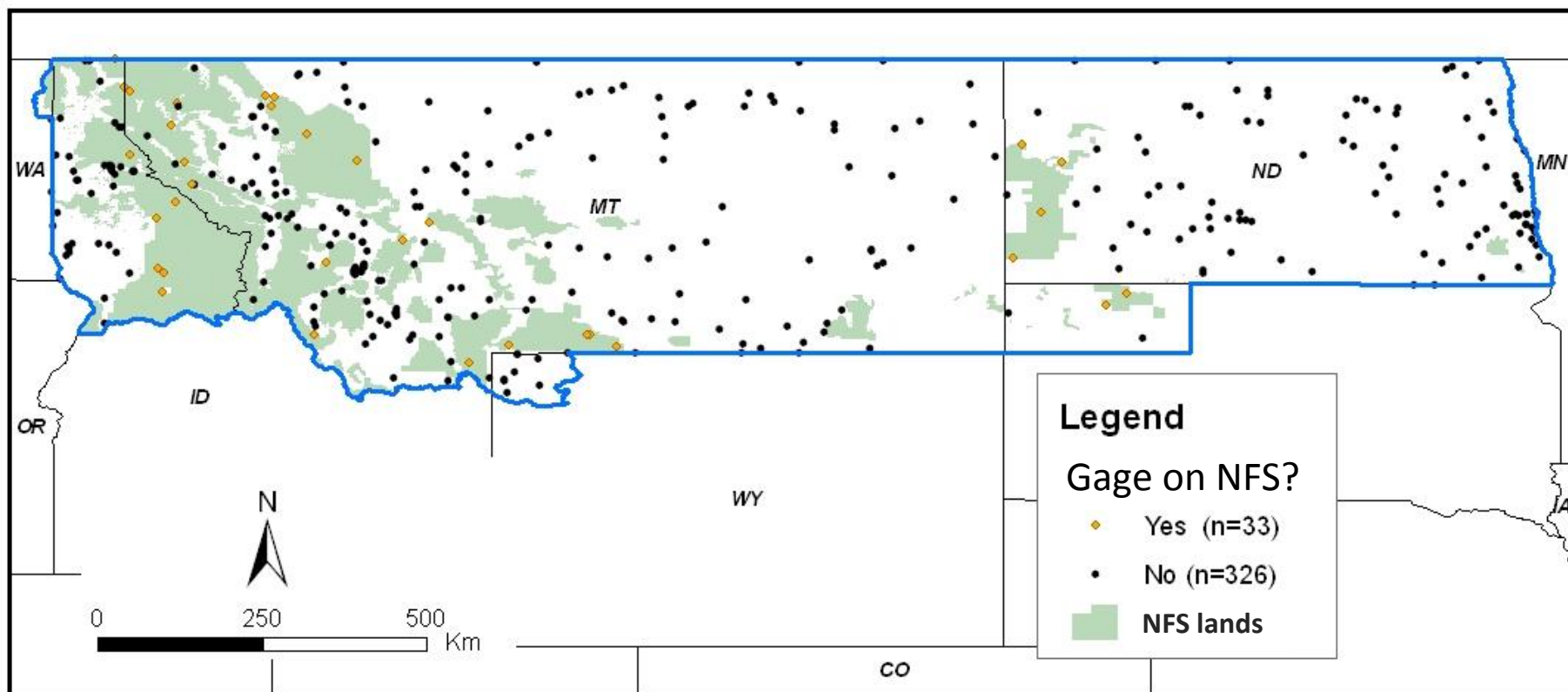
	Gages on NFS lands in R1	All gages in R1	% Gages on NFS lands in R1
Gages	160	1,167	13.7

USGS Stream Gages from 1912 - 2012: Only those on NFS Lands



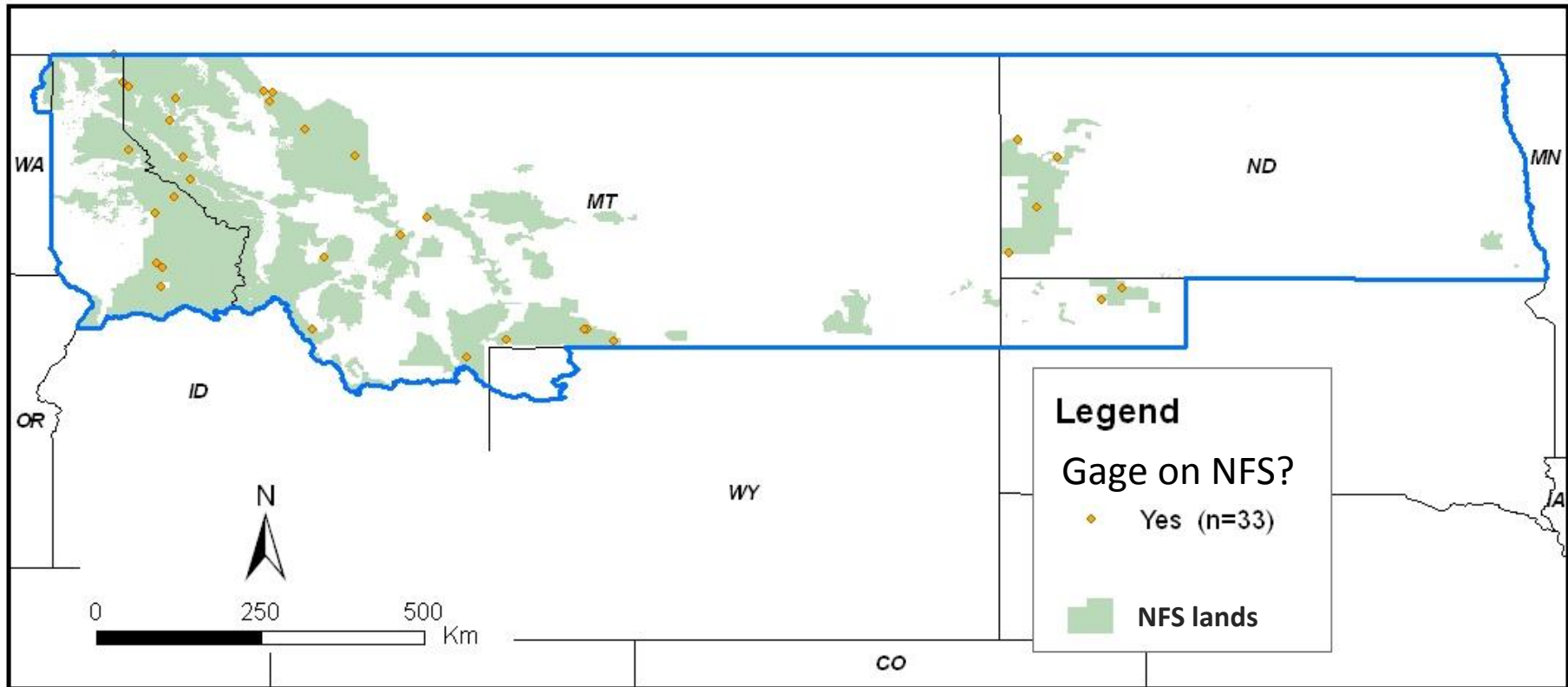
	Gages on NFS lands in R1	All gages in R1	% Gages on NFS lands in R1
Gages	160	1,167	13.7

USGS Stream Gages Currently Operational: Identifying those off and on NFS Lands



	Gages on NFS lands in R1	All gages in R1	% Gages on NFS lands in R1
Current Gages	33	359	9.2

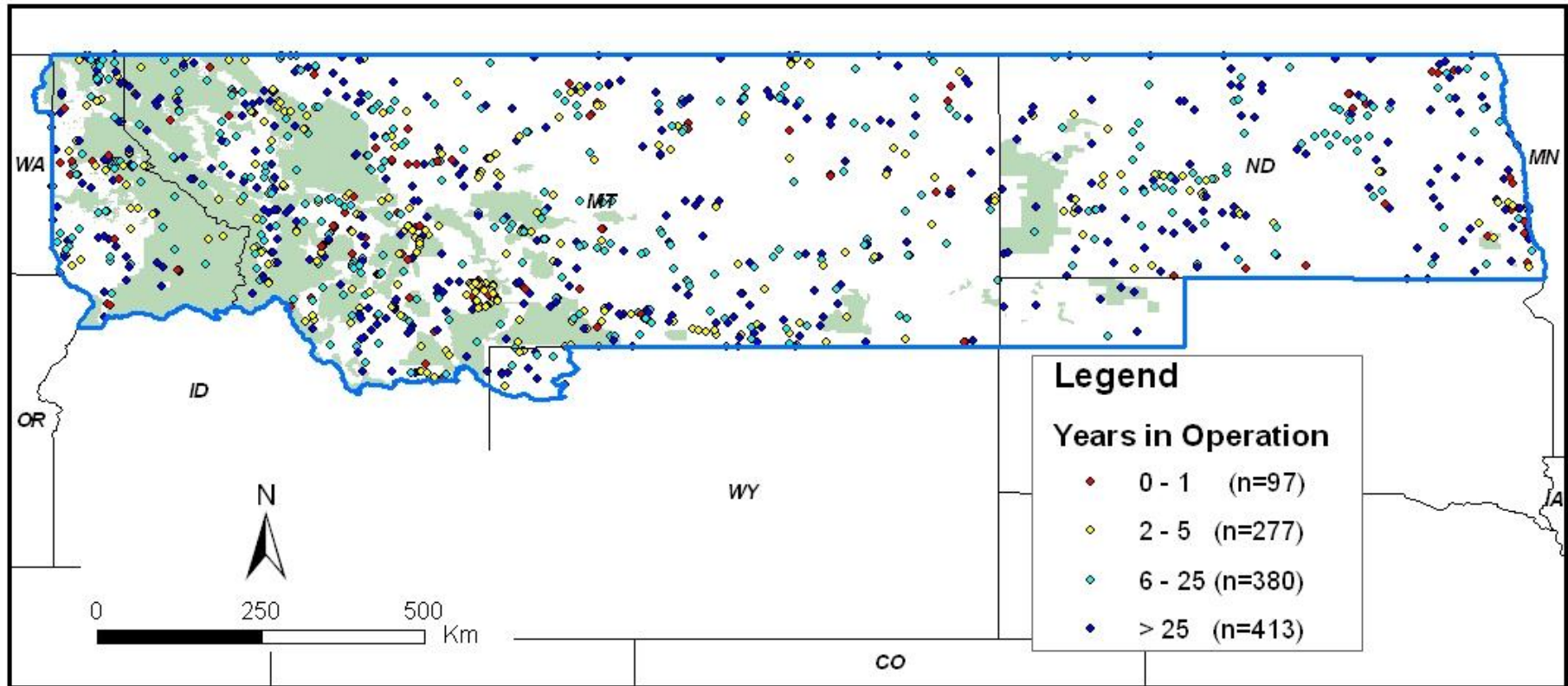
USGS Stream Gages Currently Operational: Only those on NFS Lands



	Gages on NFS lands in R1	All gages in R1	% Gages on NFS lands in R1
Current Gages	33	359	9.2

Years in Operation

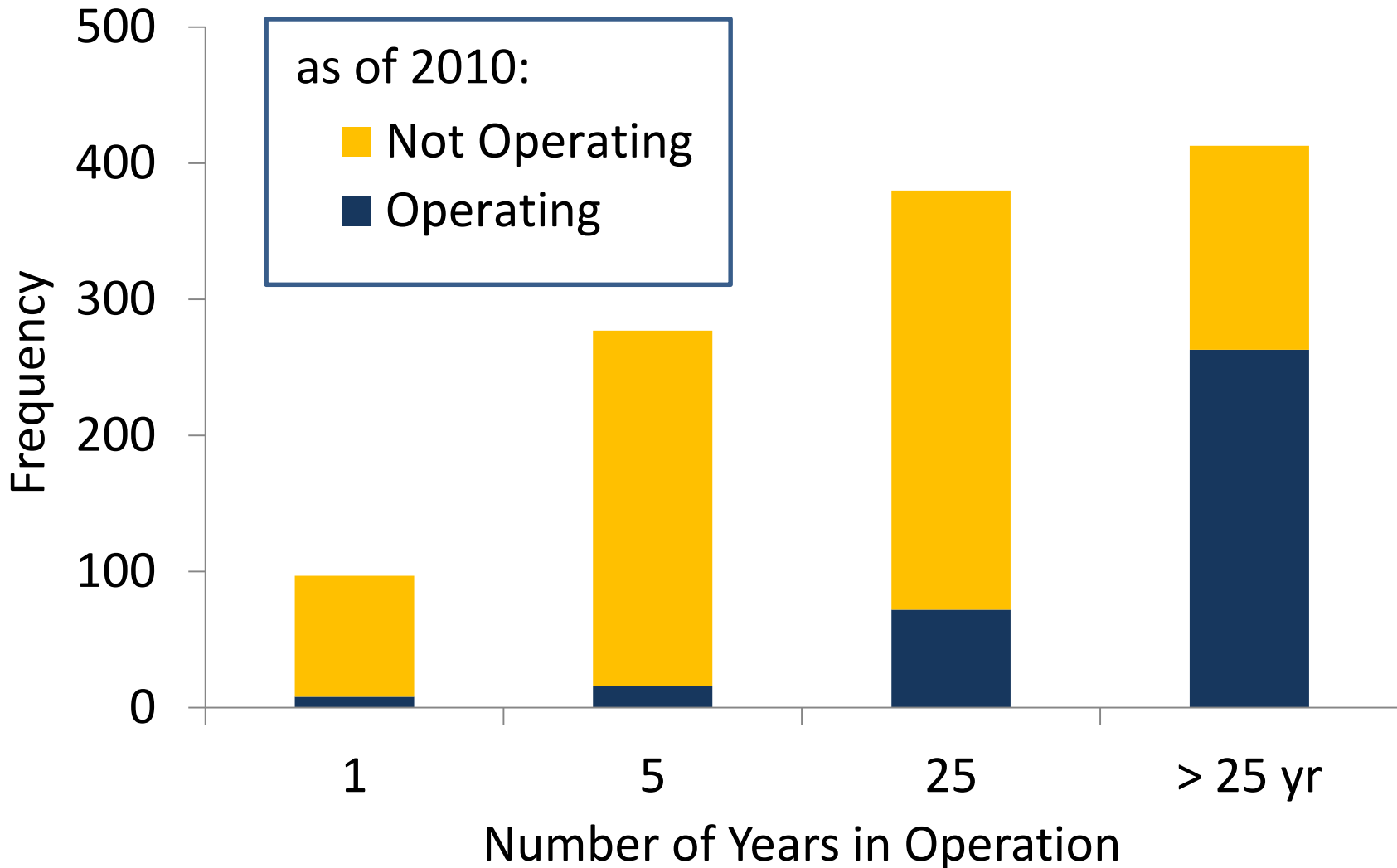
USGS Stream Gages from 1912 - 2012 (n=1,167)



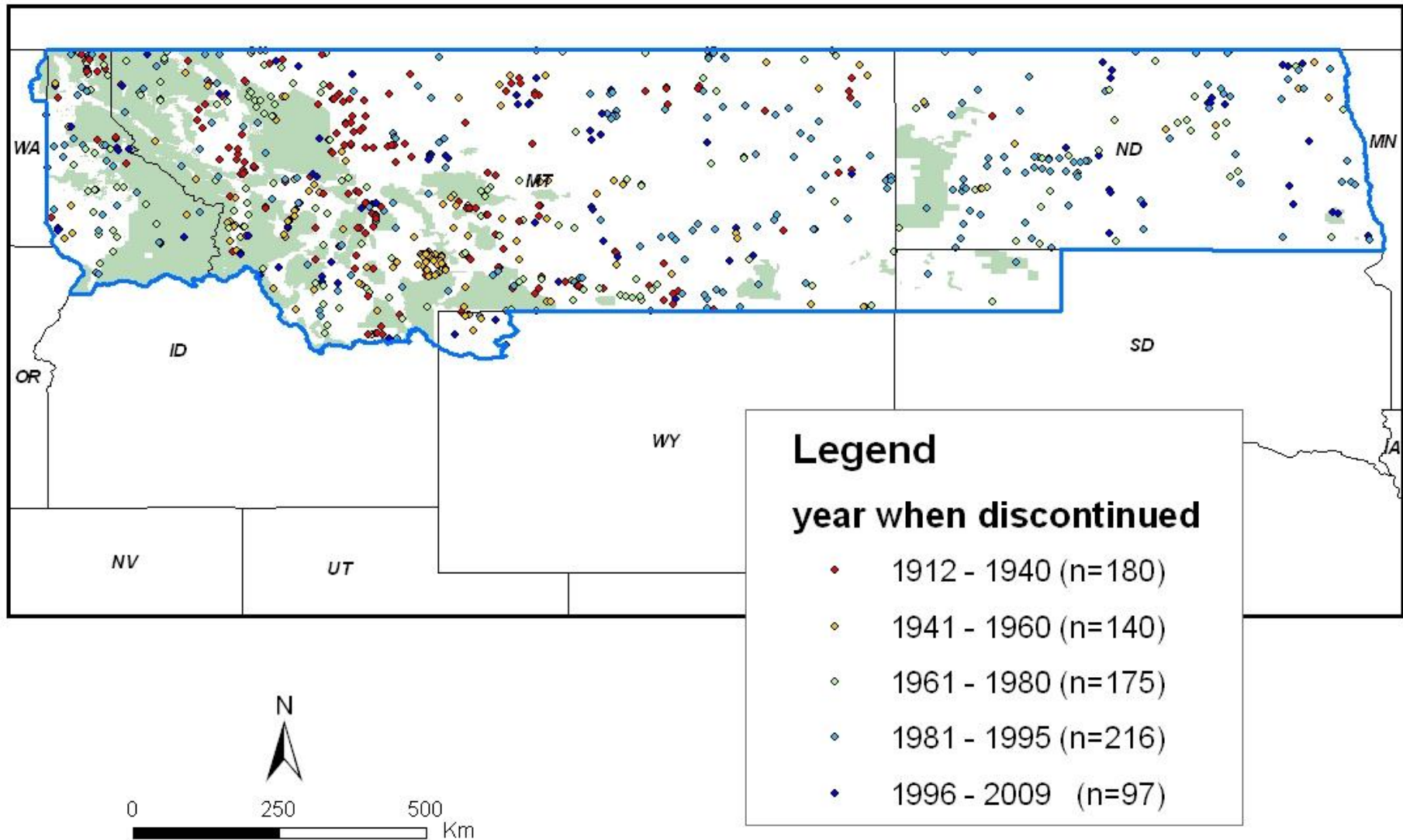
The next slide displays these data in a bar chart.

Years in Operation

USGS Stream Gages from 1912 - 2012 (n=1,167)



Year when Discontinued USGS Stream Gages from 1912 - 2009 (n=808)



Group 1

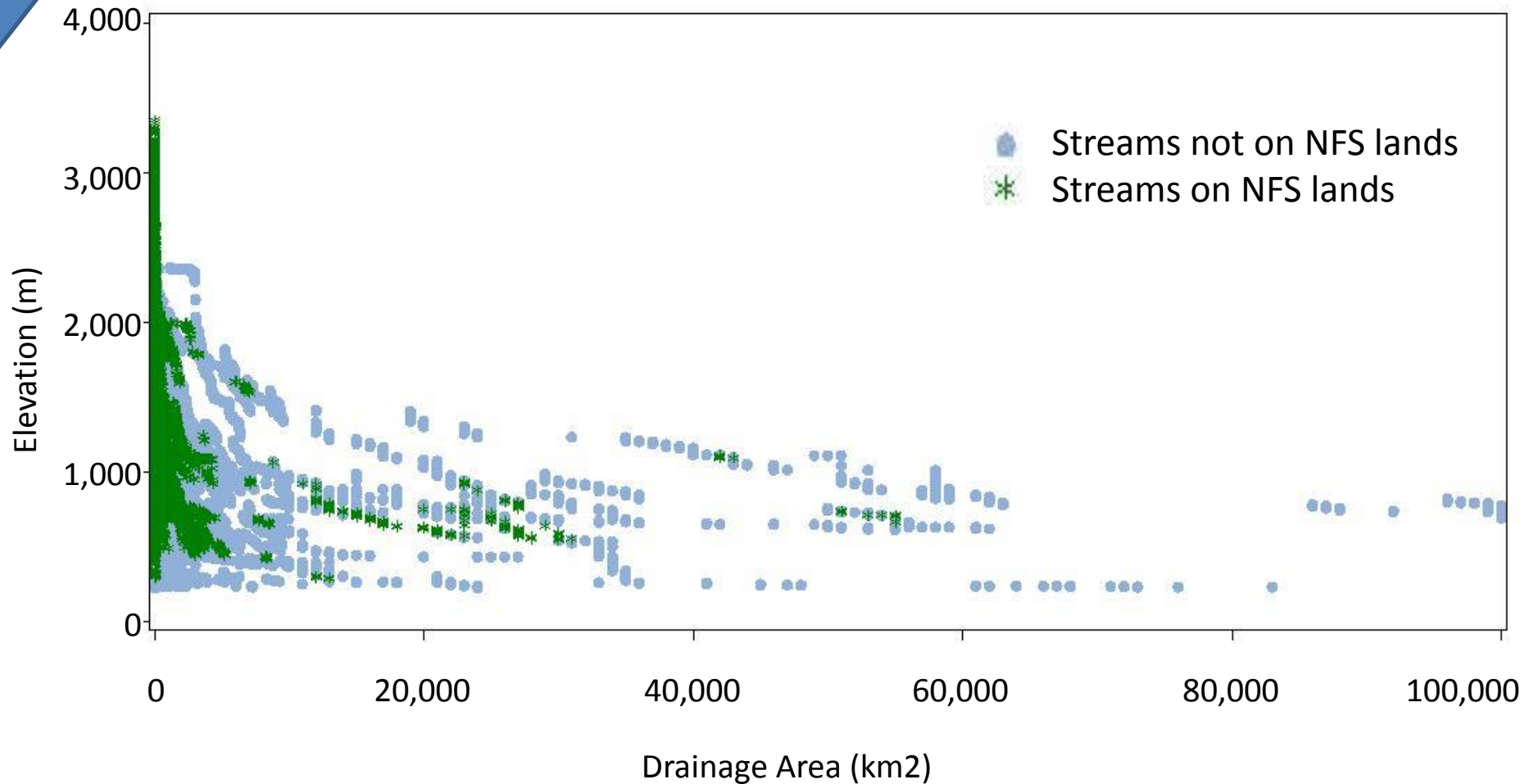
Stream Segments in Region 1

On the following 4 slides, each stream segment within Region 1 is plotted by elevation and drainage area.

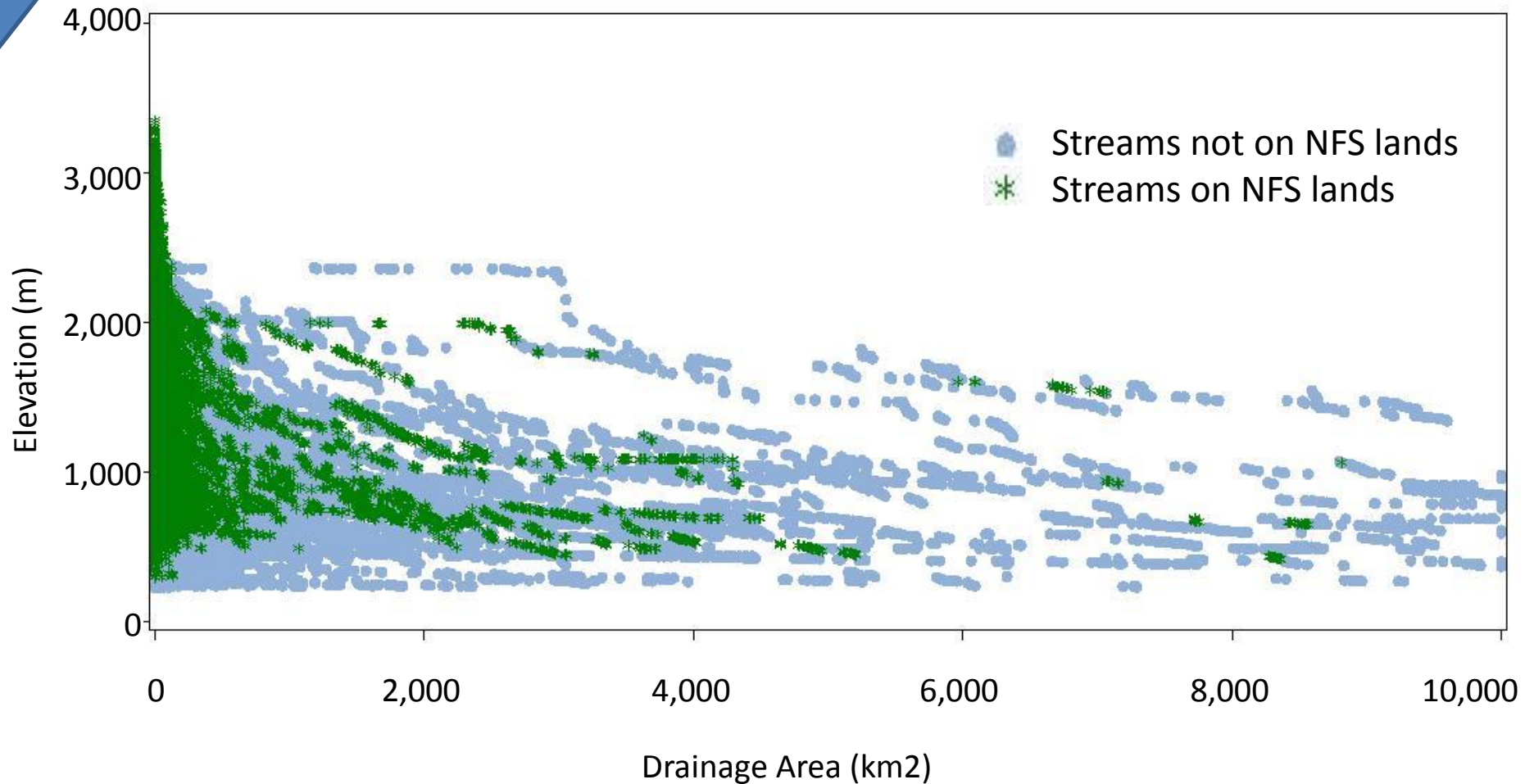
Overlaid on the region's stream segments are the stream segments located on NFS lands.

The only difference between the slides is that for each successive slide the horizontal axis will be magnified.

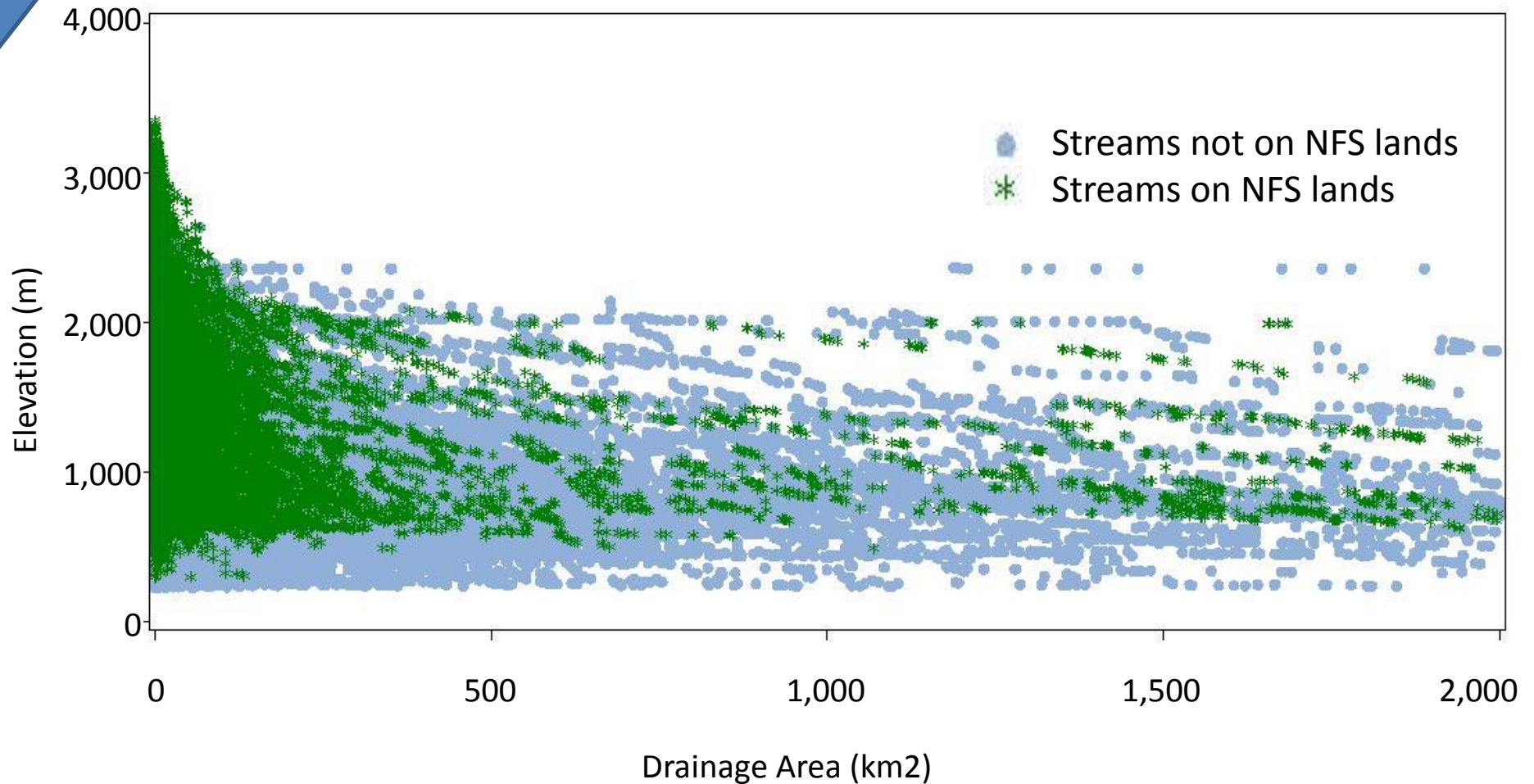
Stream Segments in Region 1



Stream Segments in Region 1



Stream Segments in Region 1



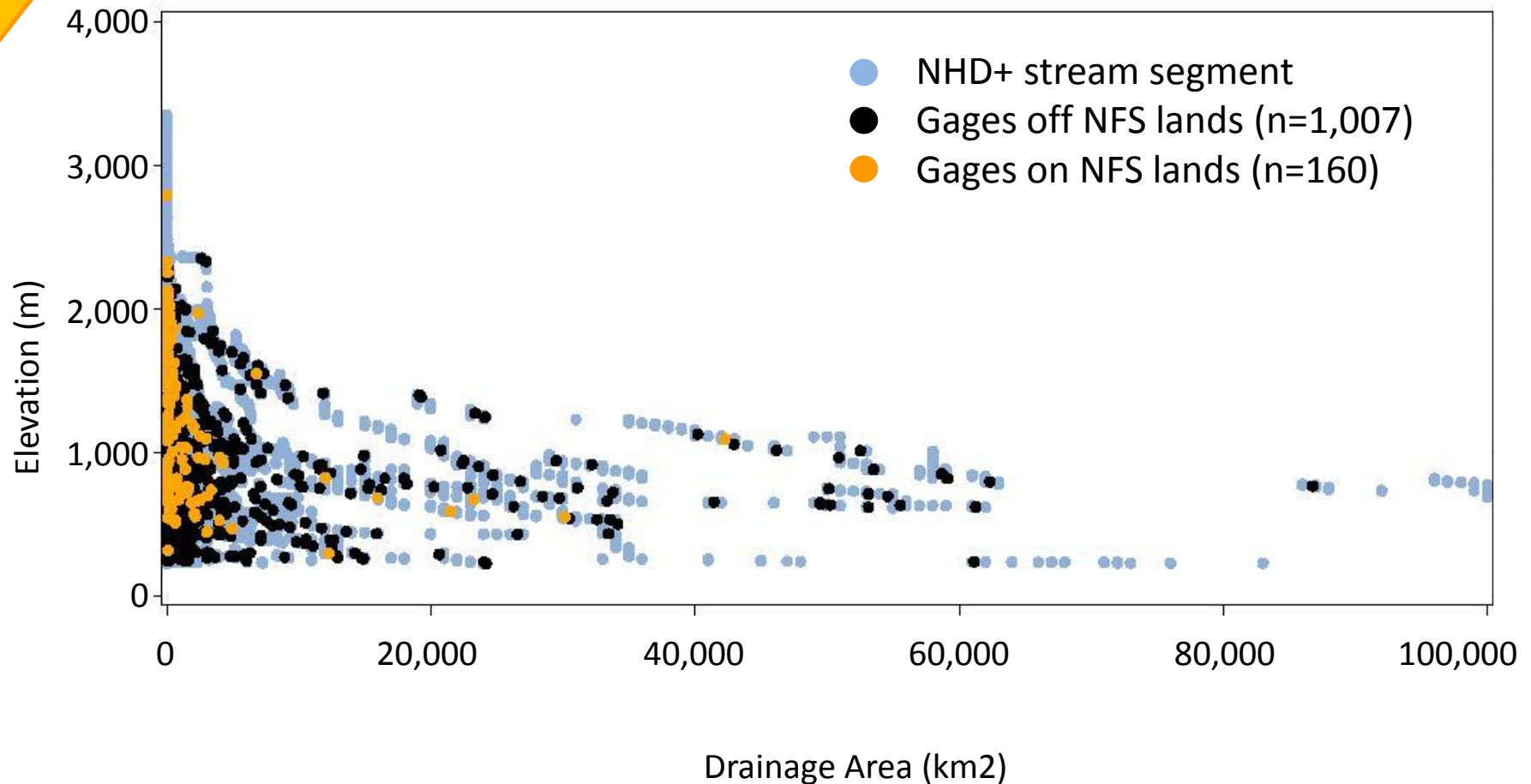
Group 2

All Stream Gages - off and on NFS Lands

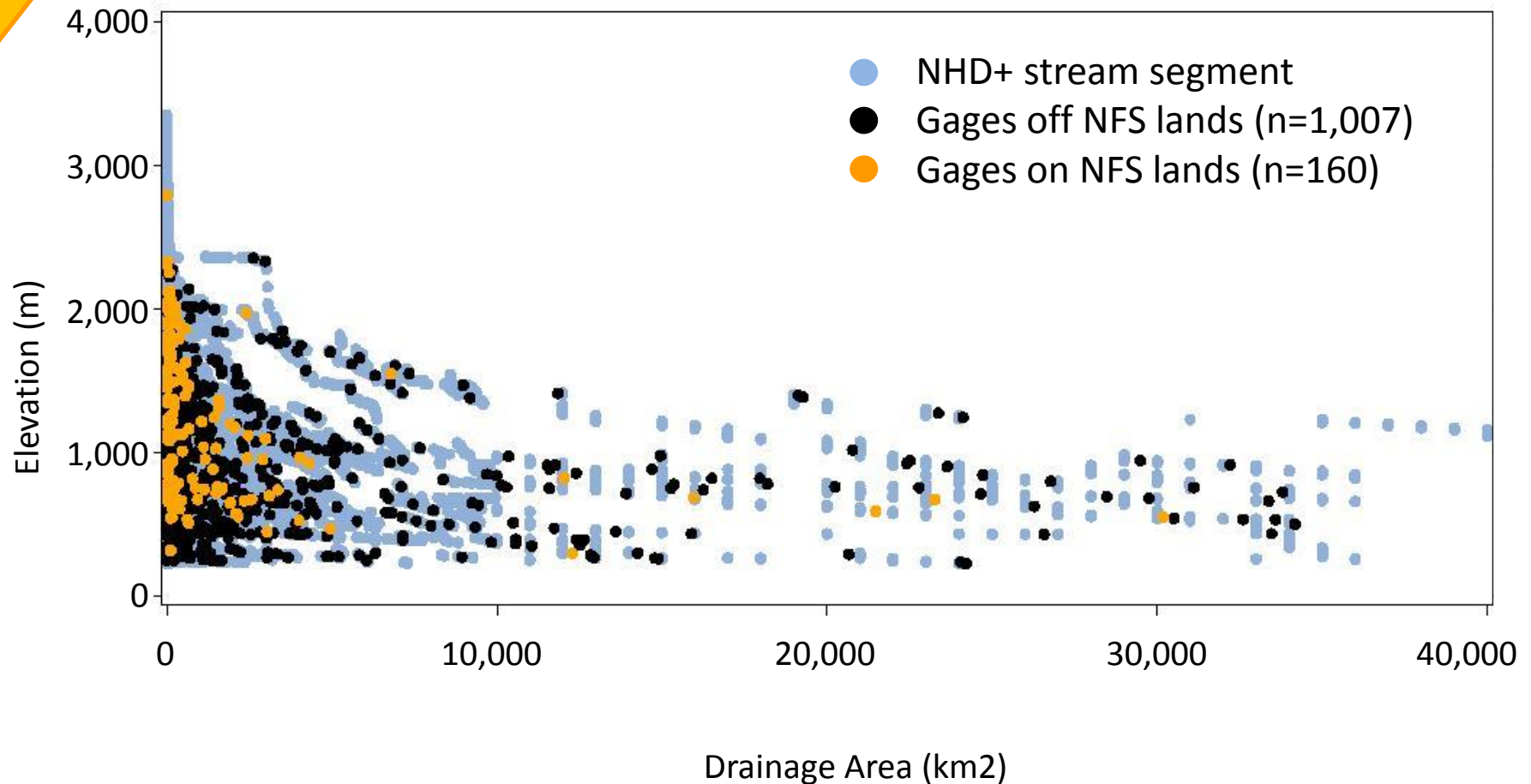
On the following 4 slides, each stream segment within Region 1 is plotted by elevation and drainage area.

Overlaid on the stream segments are the 1,167 stream gages that are/were active since 1912. There are 1,007 gages that are not on NFS lands and 160 gages on NFS lands.

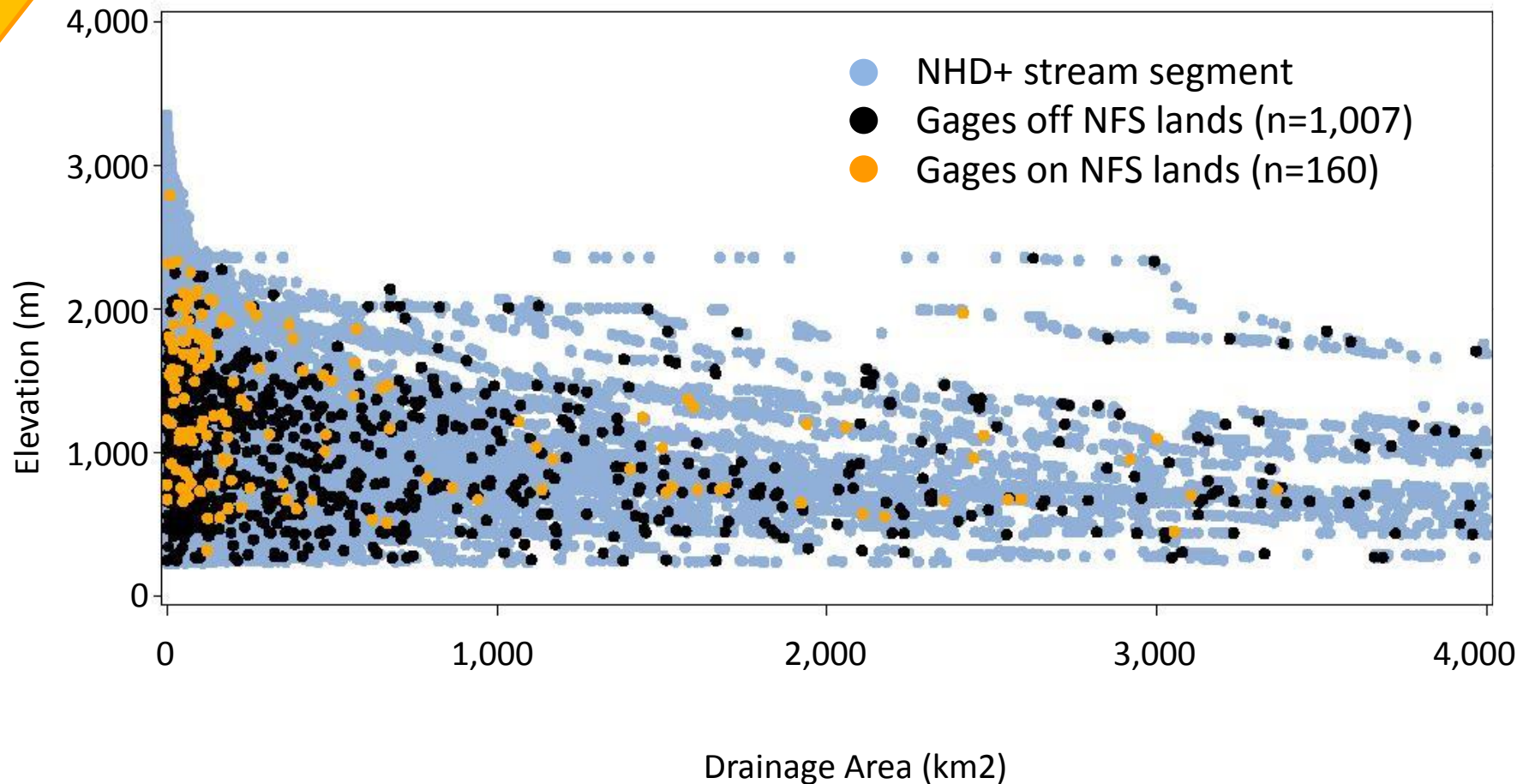
All Stream Gages - off and on NFS Lands



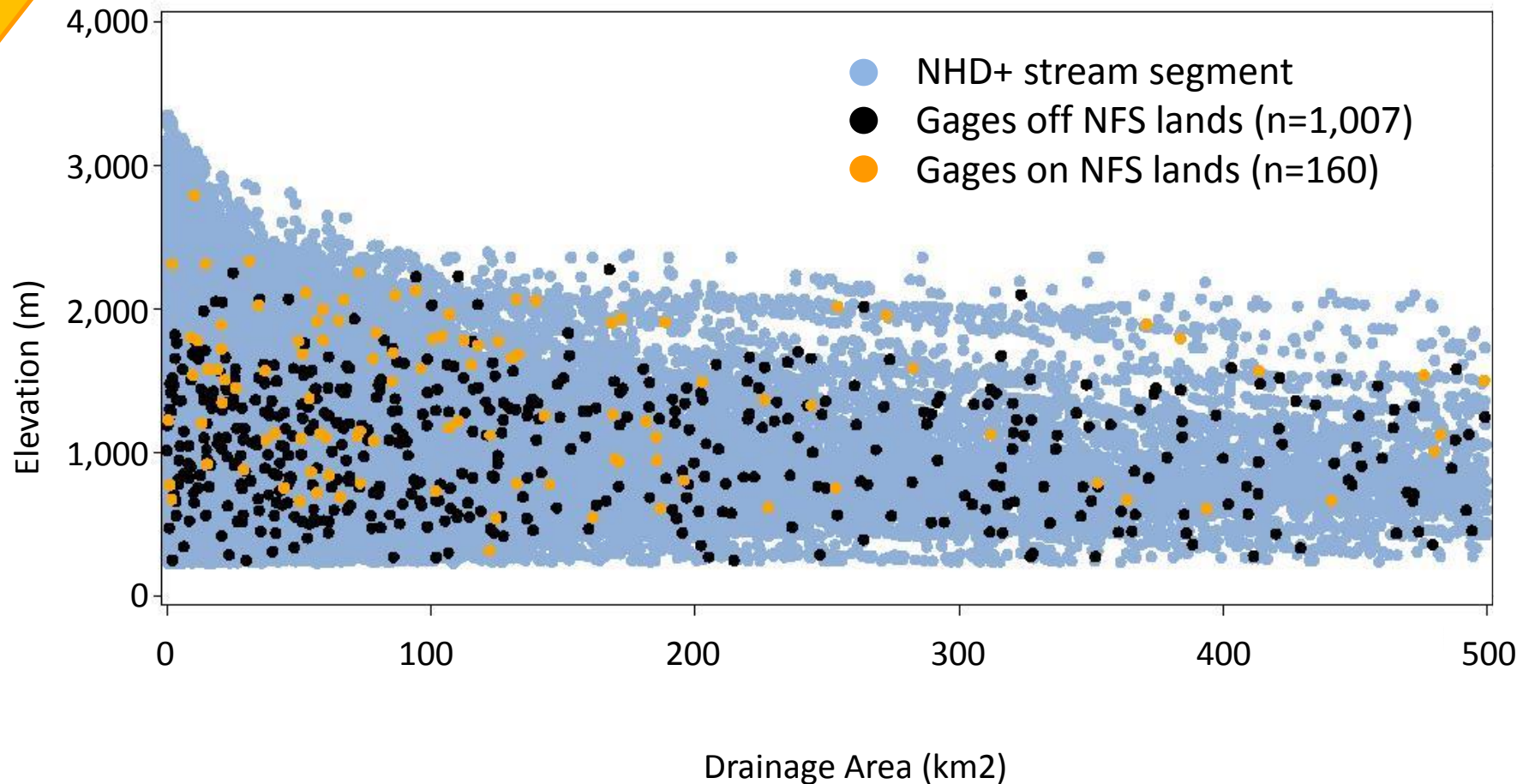
All Stream Gages - off and on NFS Lands



All Stream Gages - off and on NFS Lands



All Stream Gages - off and on NFS Lands



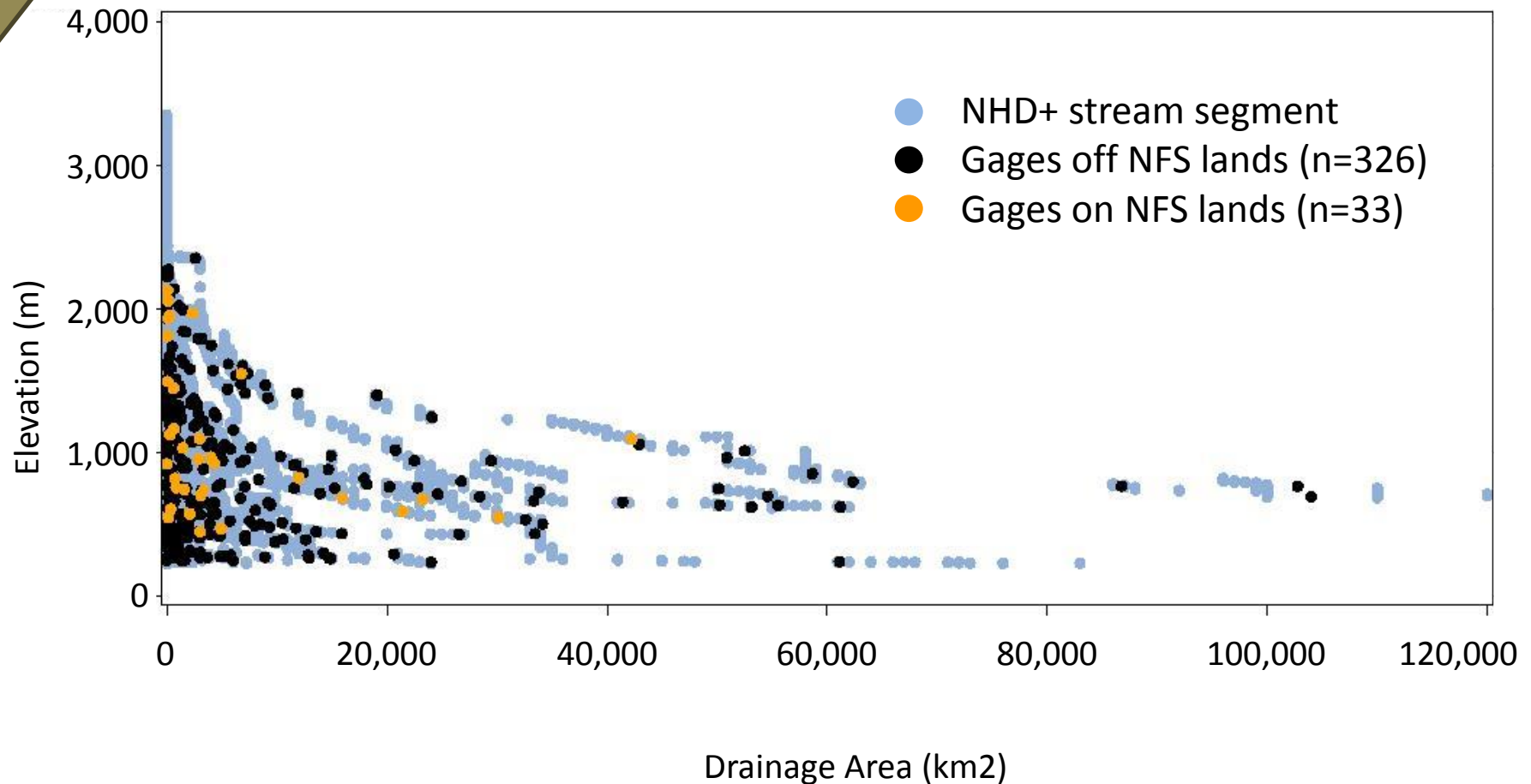
Group 3

Current Stream Gages - off and on NFS Lands

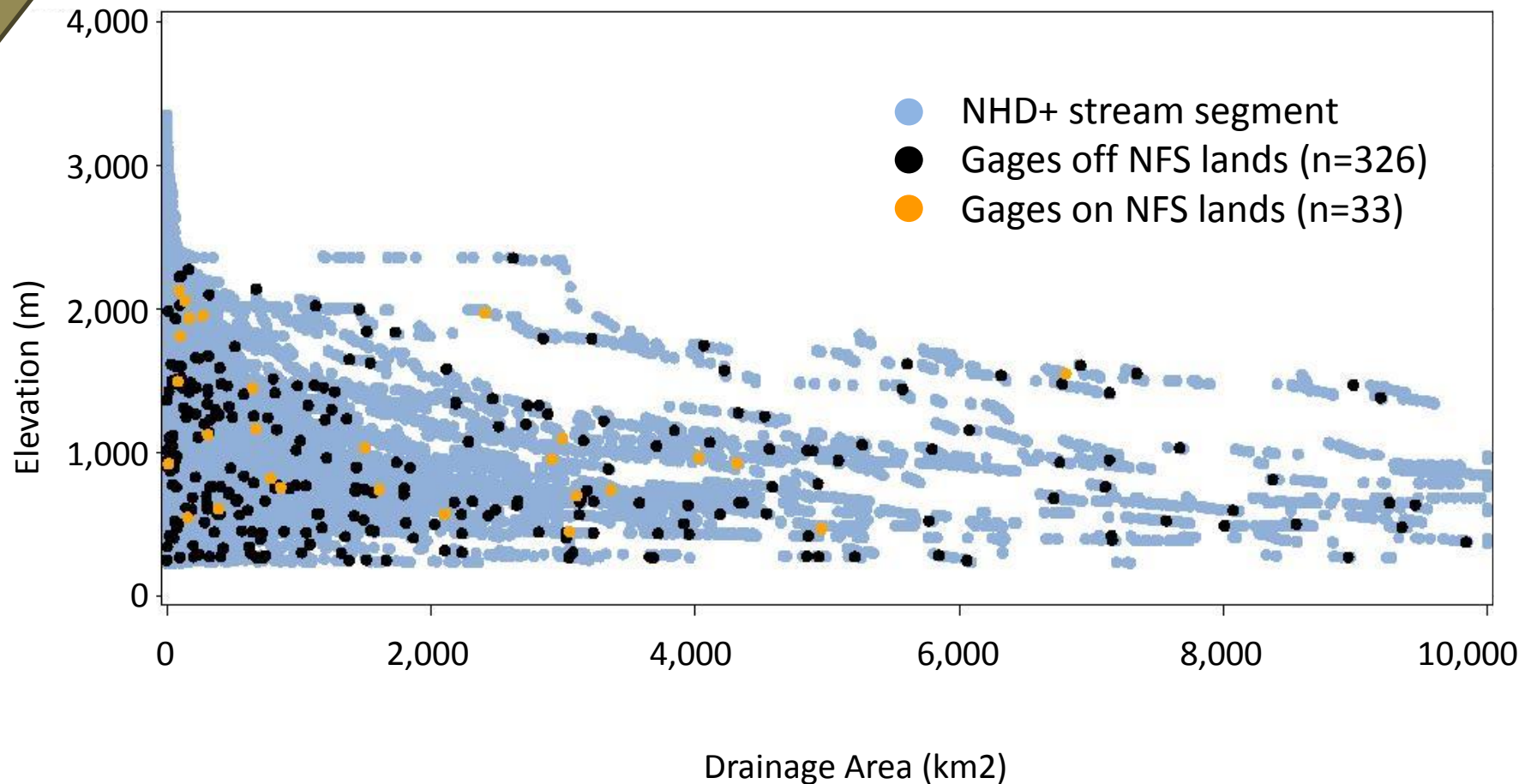
On the following 4 slides, each stream segment within Region 1 is plotted by elevation and drainage area.

Overlaid on the stream segments are the 359 stream gages that are currently operational, as of January 2010. There are 326 gages operating off NFS lands and 33 gages on NFS lands.

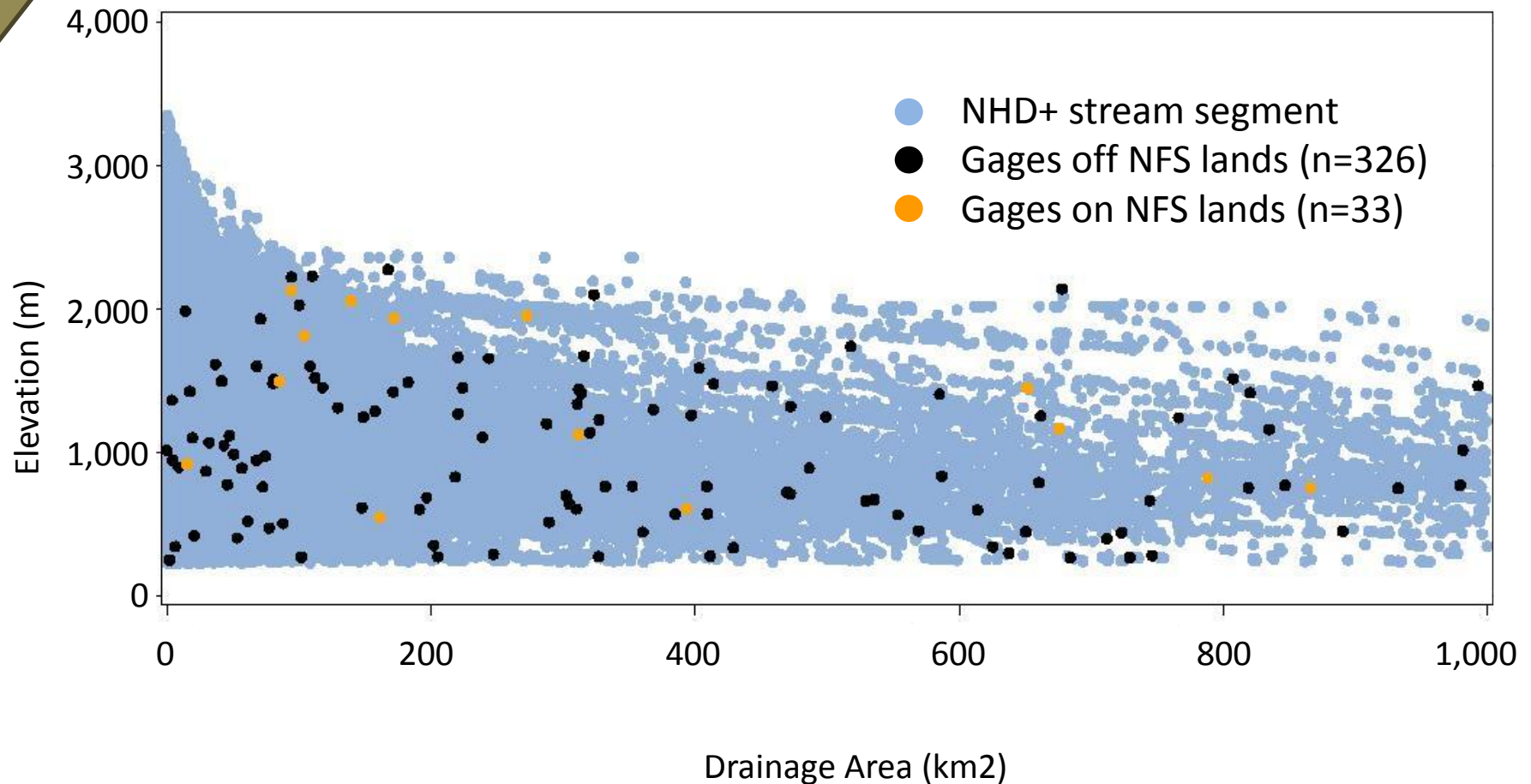
Current Stream Gages - off and on NFS Lands



Current Stream Gages - off and on NFS Lands



Current Stream Gages - off and on NFS Lands



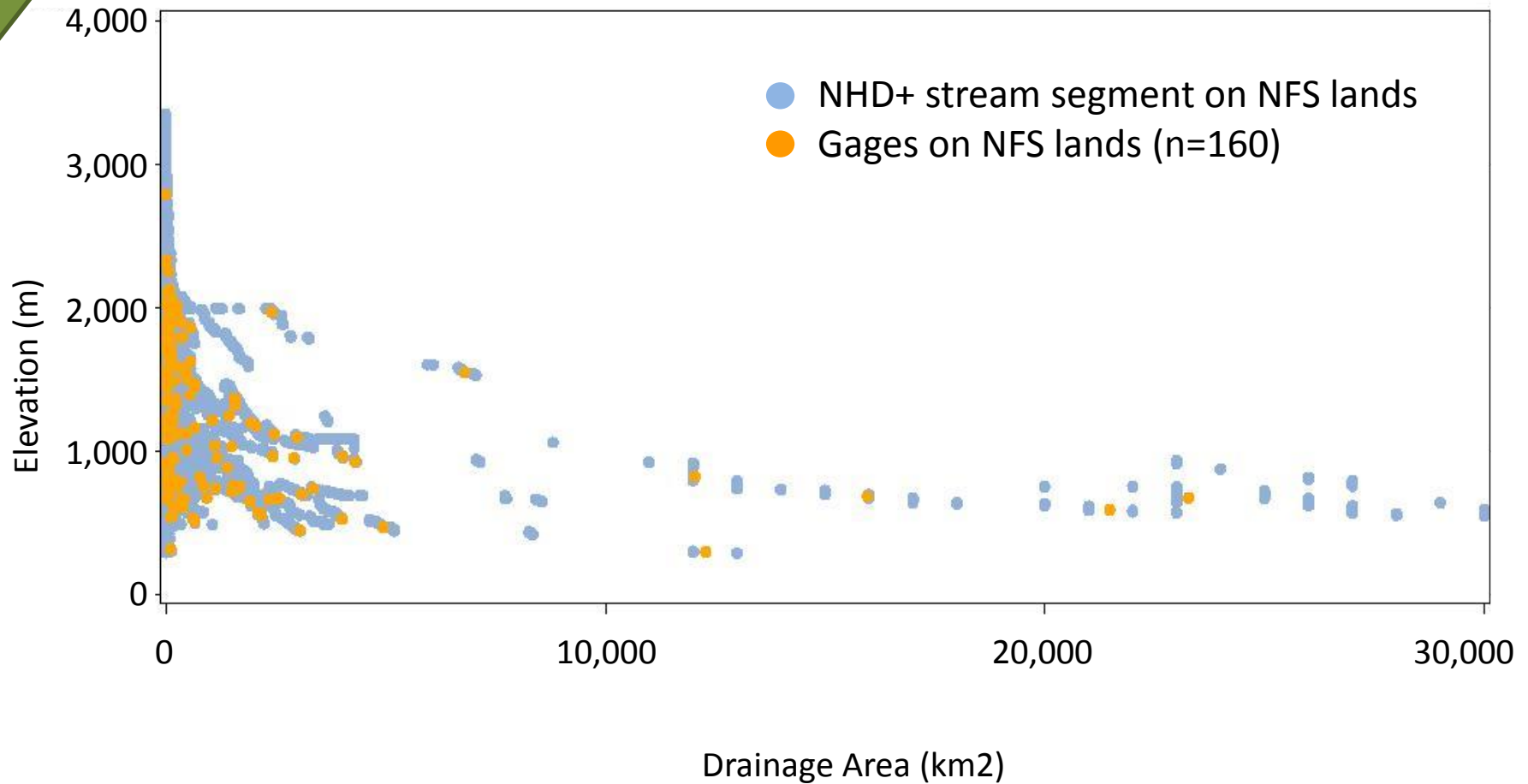
Group 4

Streams and Historic Gages on NFS Lands

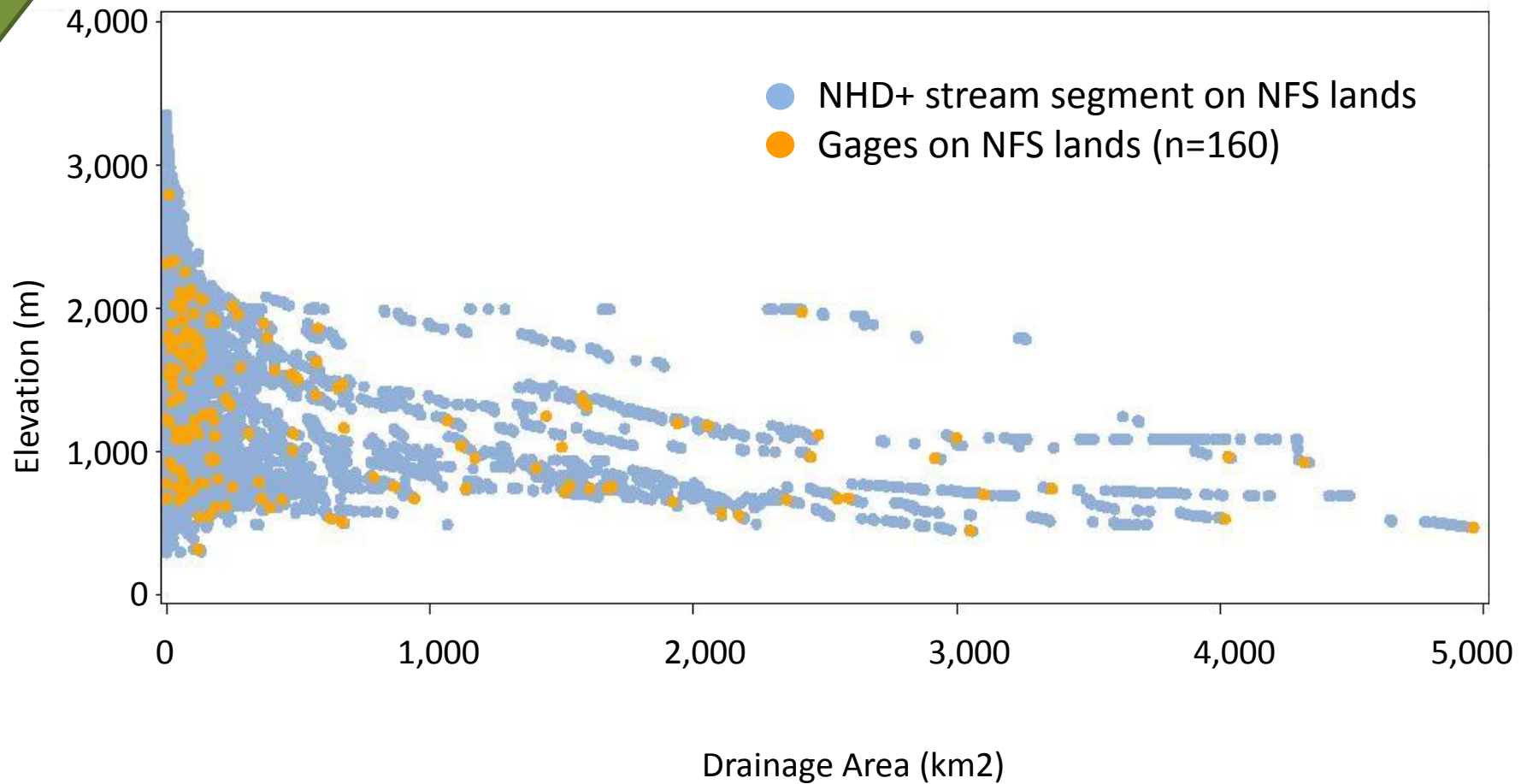
On the following 3 slides, we have plotted only the stream segments that are on NFS lands. Overlaid on the stream segments are 160 stream gages that are/were active since 1912.

These slides allow us to see the available population of stream segments, relative to the distribution of gages that occur on the Forest, versus Group 2, which showed all stream segments in the entire region.

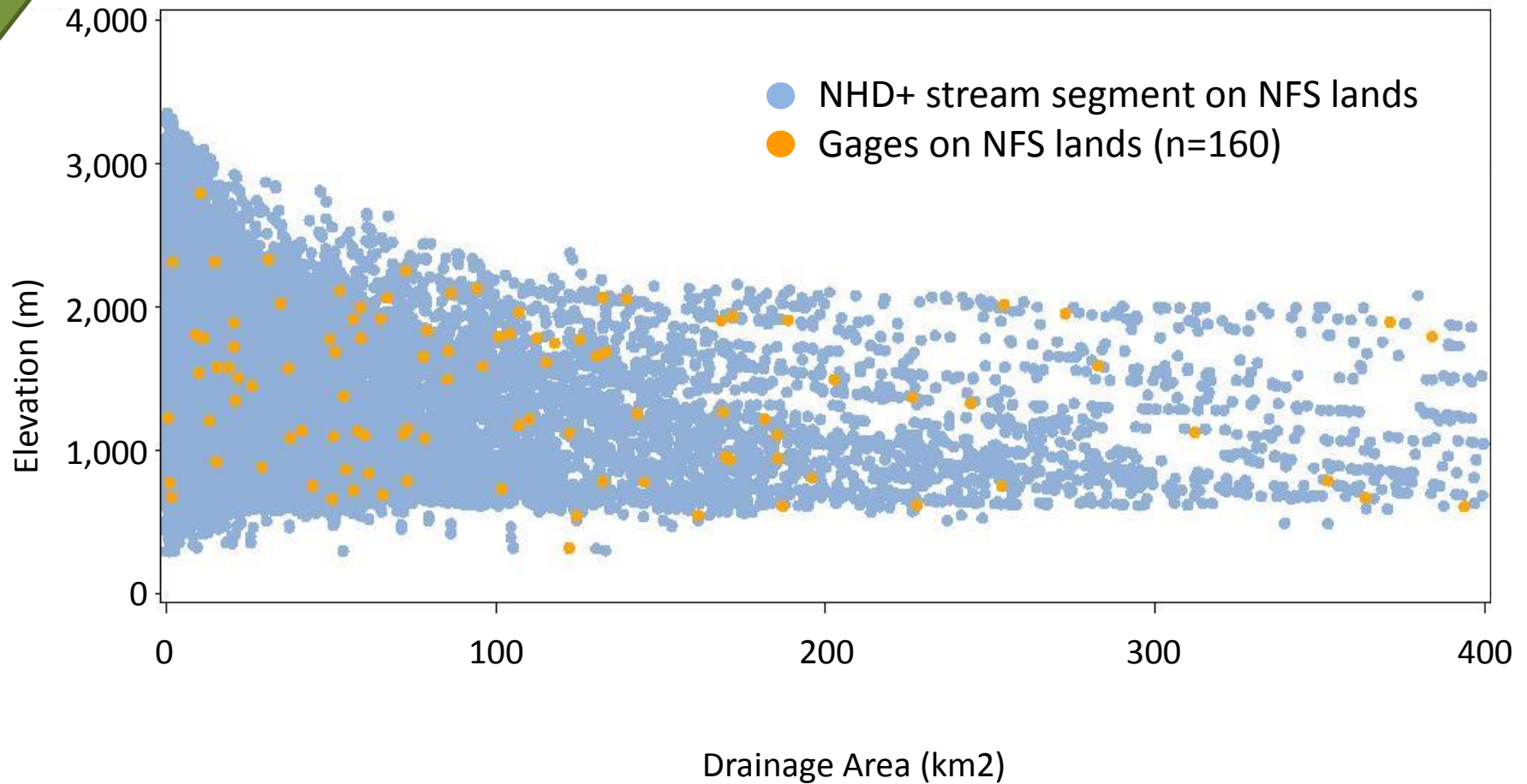
Streams and Historic Gages on NFS Lands



Streams and Historic Gages on NFS Lands



Streams and Historic Gages on NFS Lands



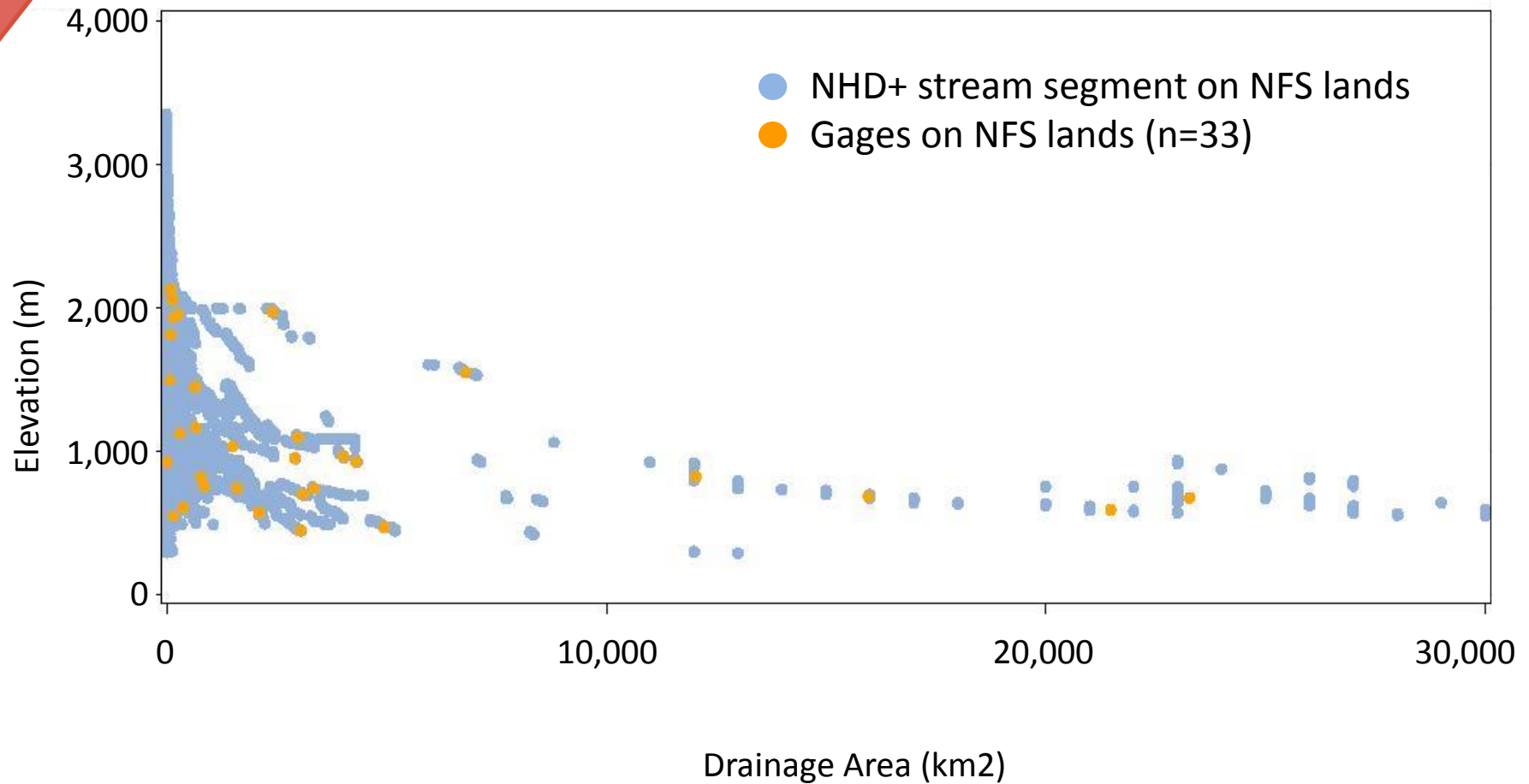
Group 5

Streams and Current Gages on NFS Lands

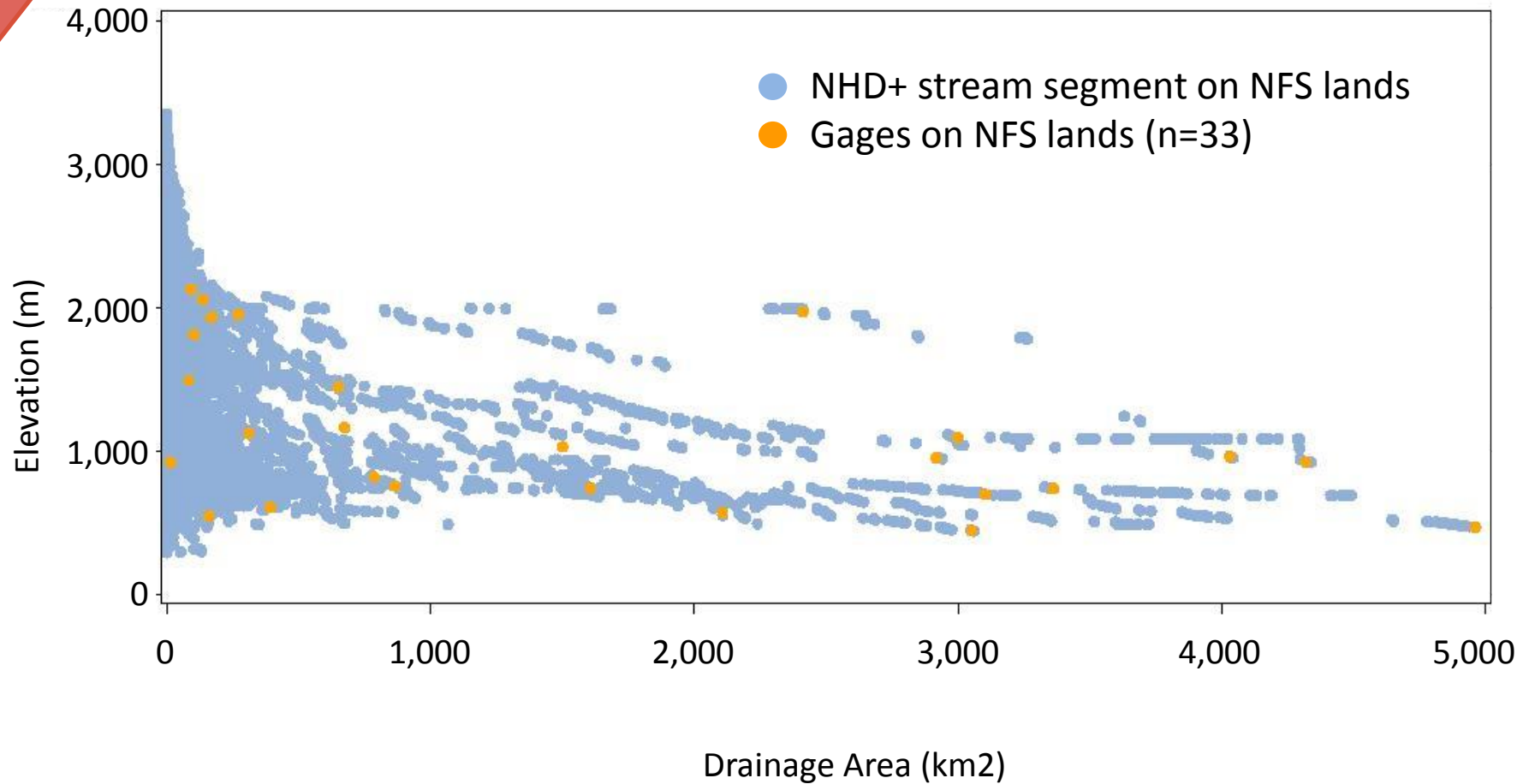
On the following 3 slides, we have plotted only stream segments that are on NFS lands. Overlaid on the stream segments are the 33 stream gages that are currently active as of January 2010.

For each successive slide the horizontal axis will be magnified.

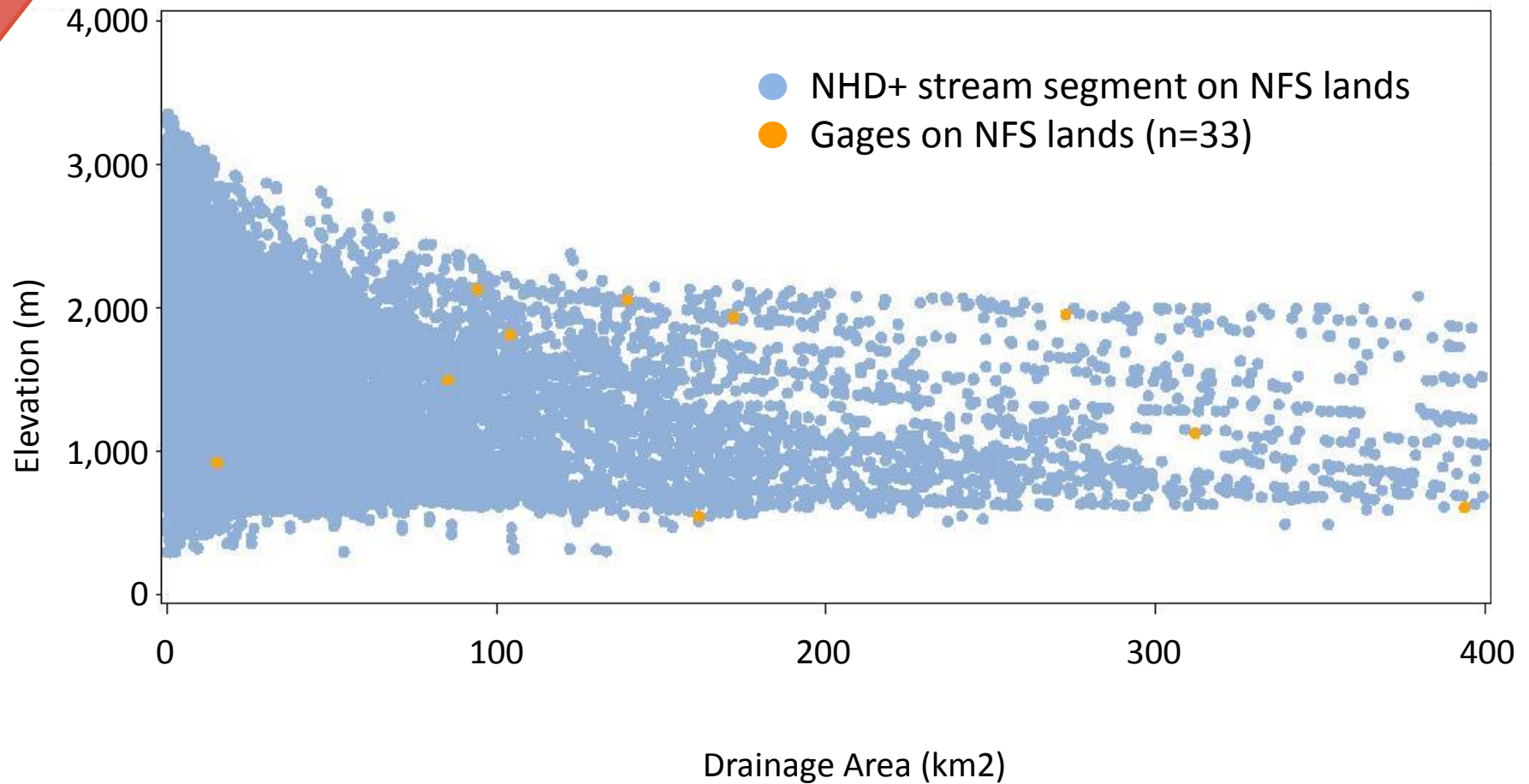
Streams and Current Gages on NFS Lands



Streams and Current Gages on NFS Lands



Streams and Current Gages on NFS Lands



Stream Gages Adjacent to NFS Lands

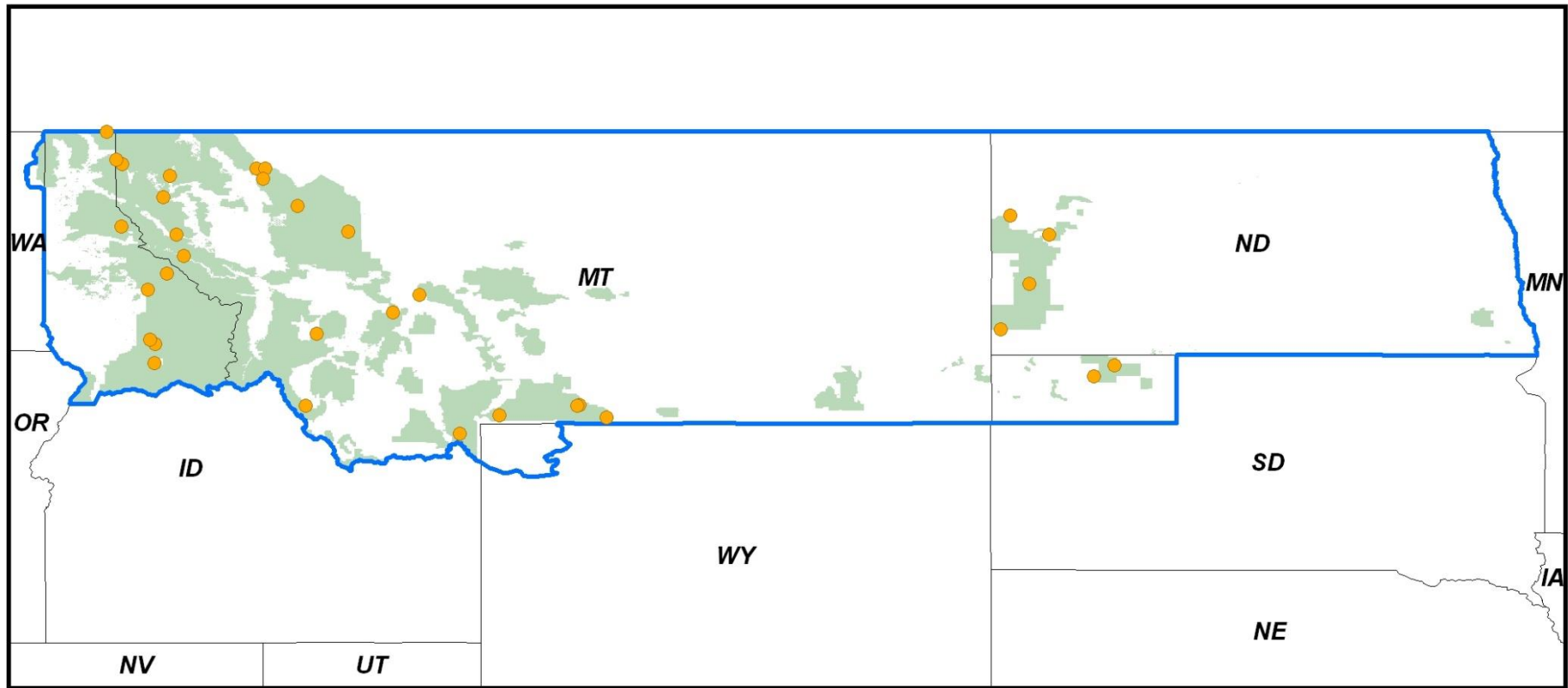
ISSUE

Many stream gages are located on waterways that are downstream of, and not on, a National Forest. In our analysis, only streams gages that touched a Forest boundary, using ArcGIS, were classified as a gage on NFS lands. This type of classification does not account for the tremendous amount of flow that influences gages immediately downstream of a Forest.

SOLUTION

On the next 6 slides we show the effect of adding a 1 Km and 10 Km buffer around the Forest boundary. We classified all gages within the buffer as being on NFS lands.

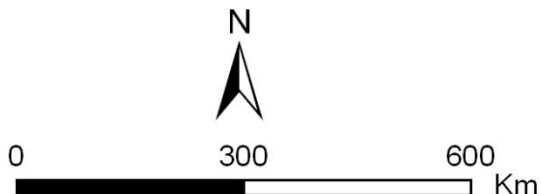
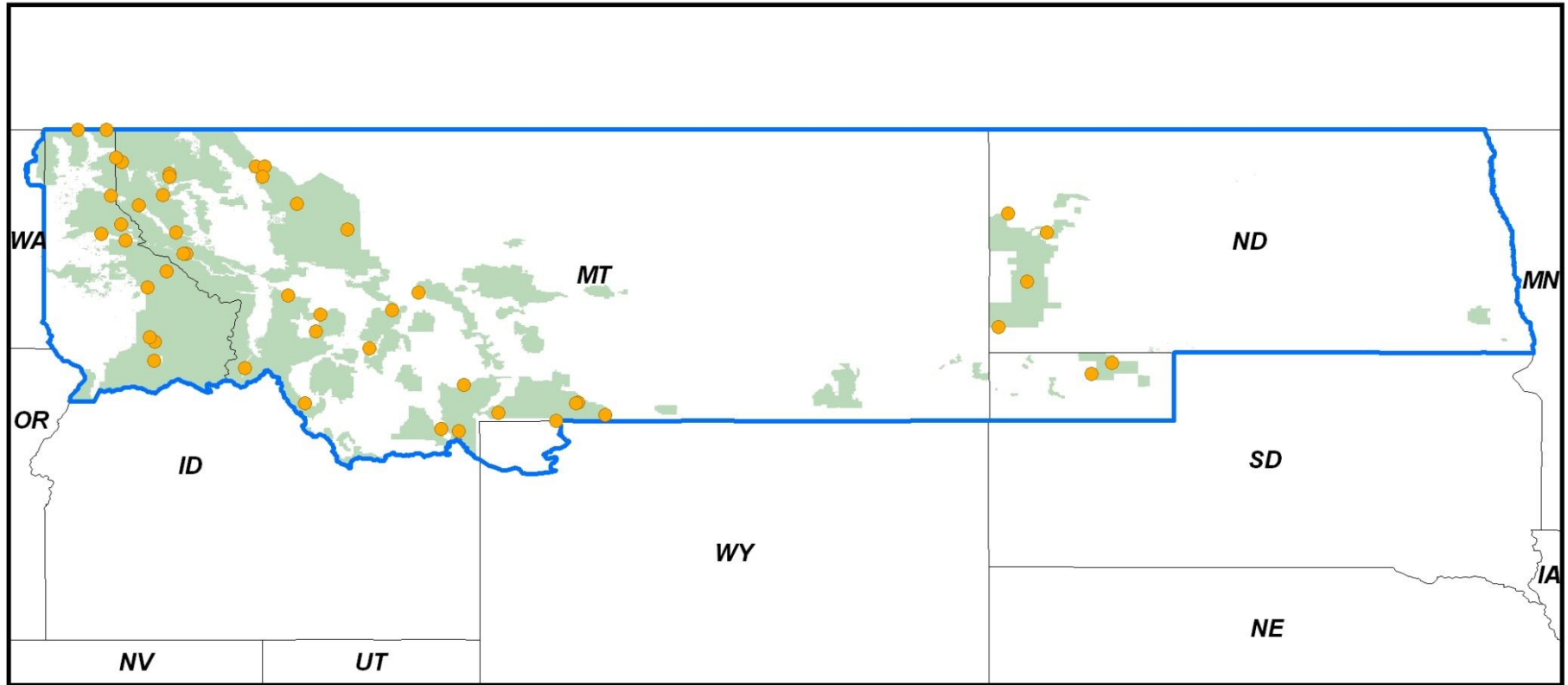
USGS Stream Gages Currently Operational: On NFS Lands - **No Buffer**



Legend

- No buffer (n=33)
- NFS lands

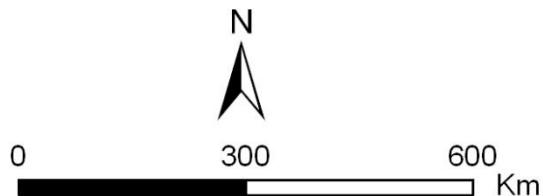
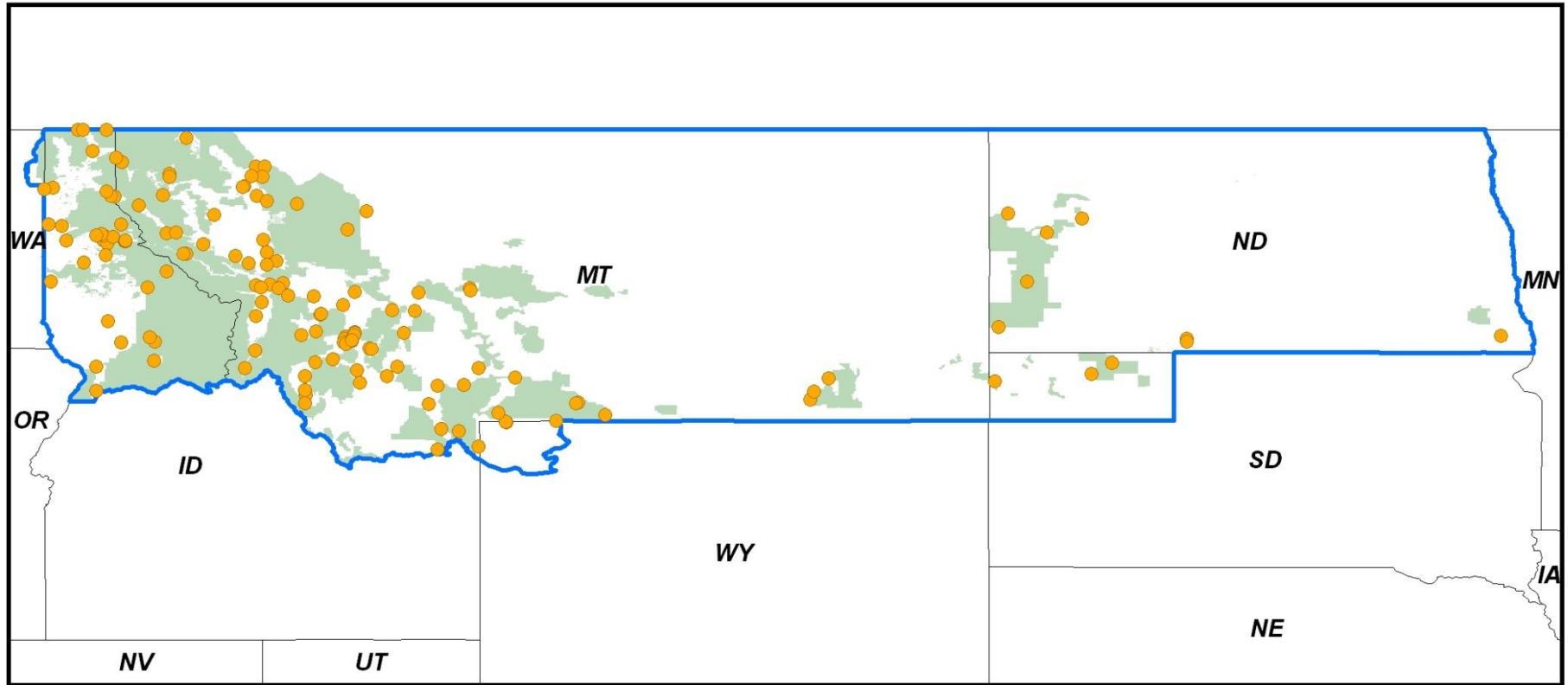
USGS Stream Gages Currently Operational: On NFS Lands - **Within 1 Km**



Legend

- Within 1 Km of NFS (n=47)
- NFS lands

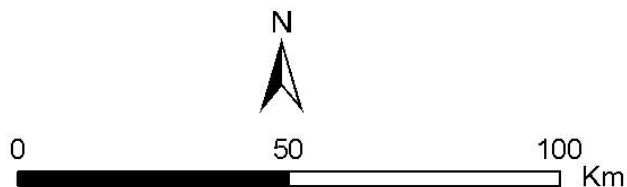
USGS Stream Gages Currently Operational: On NFS Lands - **Within 10 Km**



Legend

- Within 10 Km of NFS (n=143)
- NFS lands

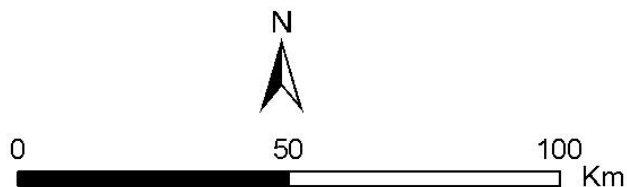
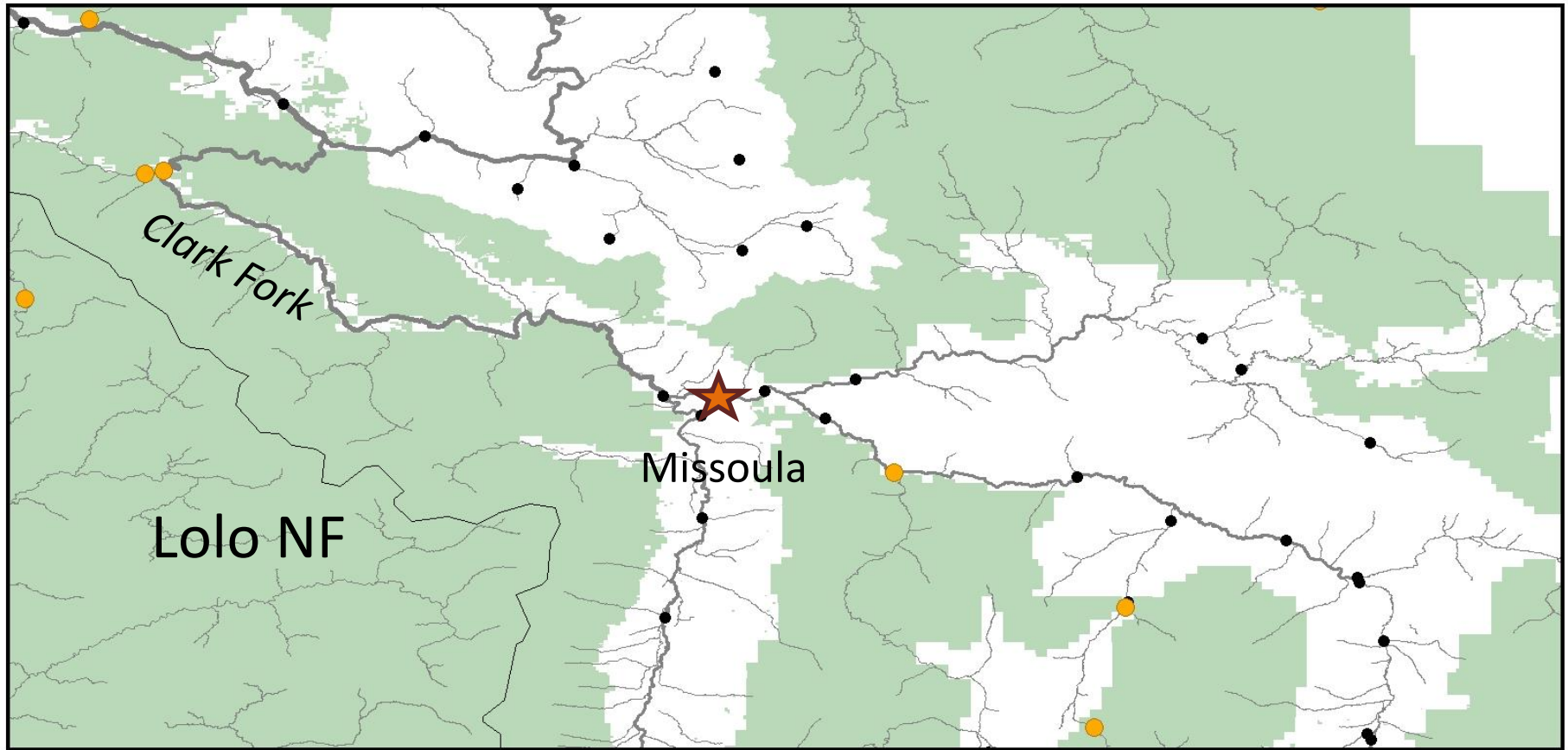
USGS Stream Gages Currently Operational: On NFS Lands - **No Buffer**



Legend

- No buffer
- Not on NFS lands
- NFS lands

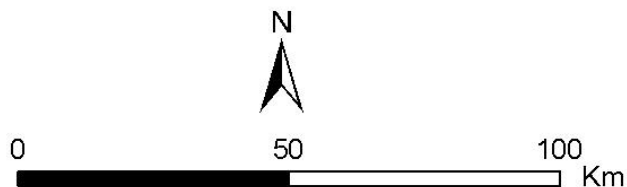
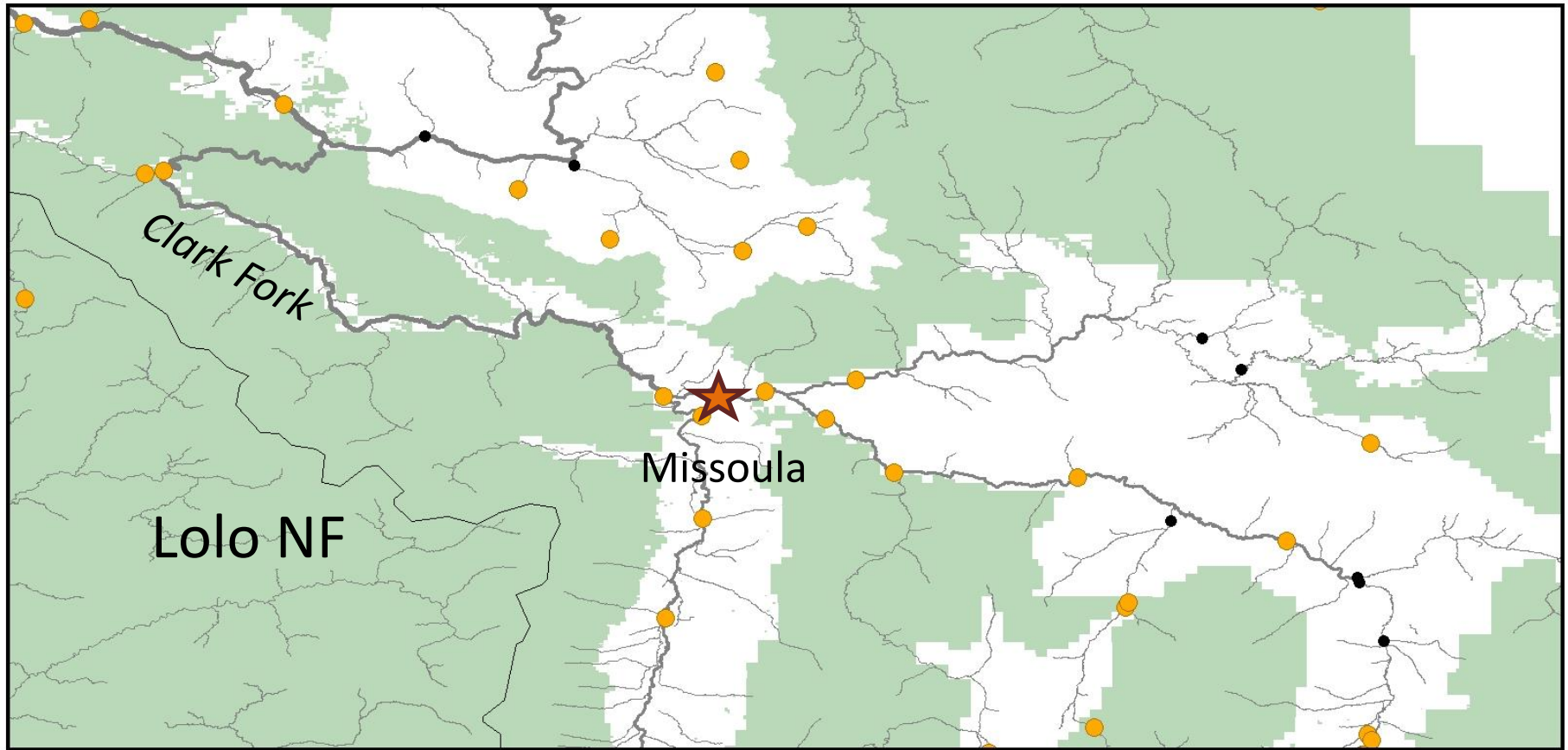
USGS Stream Gages Currently Operational: On NFS Lands - **Within 1 Km**



Legend

- Within 1 Km of NFS
- Not on NFS lands
- NFS lands

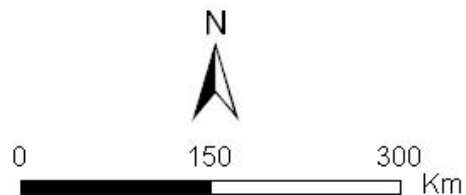
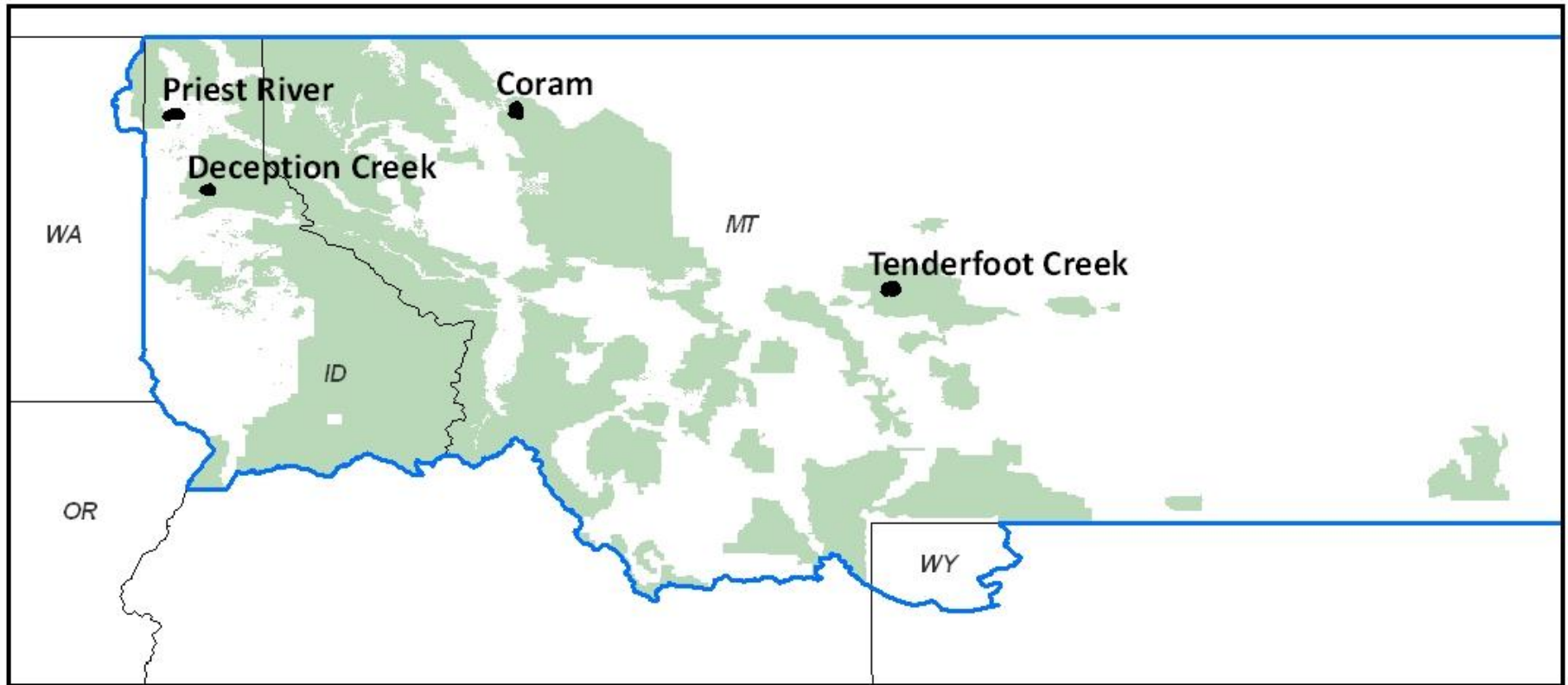
USGS Stream Gages Currently Operational: On NFS Lands - **Within 10 Km**





Legend

- Within 10 Km of NFS
- Not on NFS lands
- NFS lands

Experimental Forests in Region 1



Legend

-  Experimental Forest
-  NFS lands

